THE AMERICAN BREEDERS MAGAZINE

"My people are destroyed through lack of knowledge."—HOSEA 4: 6.

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THOMAS ANDREW KNIGHT, 1759-1838

The passing of sterling qualities, straight through four generations of a family is in itself a circumstance worthy of notice, but when this is coupled with the fact, that this transmission culminated in a man who plainly was a genius, this bit of genealogy assumes decided interest.

The great-grandfather of Thomas Andrew Knight, Richard Knight, was according to the traditions of the family a wealthy man. The grandfather, also named Richard, was very wealthy as judged by financial standards of his day; he was an industrialist and iron merchant and was the founder of the family fortune. The father was a wealthy man's son, and so was Thomas Andrew Knight himself.

Thomas Andrew Knight was the youngest of a childship of four, there being one brother and two sisters. It seems that the early schooling of both of these boys had been greatly neglected, but they had inherited fine minds which stood them in good stead. As a boy he learned rapidly; possessing an almost phonographic memory; the quotation of a single line of certain of the classics would elicit from him the recitation of pages upon pages. He was exceedingly fond of out-door life with its exercises, its sport and especially its unlimited opportunities for observation and research. This, coupled with his love for agriculture defined for him his field of work, then unexplored territory, and recognizing no boundaries, he gave free rein to his talents.

The elder brother, Payne, despite his disadvantages in education, developed into a scholar, art critic, collector and writer, and was a member of Parliament for twenty-six years.

Thomas Andrew Knight married Miss Frances Felton with whom he led a most affectionate married life. He settled at Elton, purchased a farm, equipped and stocked it and then threw himself into the study of horticulture and of biological problems, especially vegetable physiology.

THOMAS ANDREW KNIGHT

Animal life also received his attention; he was especially fond of studying animal behavior and in his extensive farming operations he naturally entered upon the breeding of live stock. He owned and bred with much skill and judgment a herd of Herefordshires, successfully showing at Smithfield and Hereford and earning many prizes. It is interesting in this connection to note that the researches he made into the cause of the superiority of the Hereford, led him to attribute this quality to the introduction of a breed of cattle from Flanders, by Lord Scudamore whose death took place 1621. A Merino ram presented to him by George III was the foundation of a breed made by crossing with the Ryeland breed of sheep. This flock Knight bred for a number of years. He is also credited with having made an importation of Norway ponies, probably Fjord horses, intending to add some of the qualities to the stock of English work horses.

Although most of his scientific work was far in advance of his time, he combined this with an unusual degree of practical sense. He never lost himself in speculations. Utility and practical end results were ever kept in sight in all his numerous and varied investigations. He worked out much of what we know of the theory of horticulture.

In 1797 he took active part in the organization of an agricultural society of Herefordshire. In 1802, a commissioner sent by the Czar of Russia to England, to procure for breeding purpose some pure blooded cattle and sheep for the imperial estates, delegated Mr. Knight to make the selections and purchases from the famous herds of England.

Knight's contributions to plant breeding were important. He was, so far as history notes, the first person to cross pollenate the flower of the apple for the purpose of creating new varieties through new combinations of characters. He placed in the hands of the English fruit growers many of their best varieties. From the application of his newly discovered method of combining desirable qualities by crossing of apples, it was a logical step to breeding vegetables and flowers. In the search for laws underlying the transmission of certain characters which he observed, it was not a mere coincidence that he, as did Mendel many years after, chose the common garden pea for experimentation. In a paper on the "Supposed Influence of the Pollen in Cross Breeding upon the Color of the Seed Coats of Plants and Qualities of Their Fruits," read before the Horticultural Society in 1823, a year after Mendel was born, he gives this reason for using the pea:

The numerous varieties of strictly permanent habits of the pea, its annual life, and the distinct character in form, size, and color of many of its varieties, induced me, many years ago, to select it for the purpose of ascertaining, by a long course of experiments, the effects of introducing the pollen of one variety into the prepared blossoms of another. My chief object in these experiments was to obtain such information as would enable me to calculate the probable effects of similar operations upon other species of plants; and I believe it would not be easy to suggest an experiment of cross breeding upon this plant, of which I have not seen the result, through many successive generations. . . . . I shall, therefore, proceed to give a concise account of some of these experiments, or rather to state the results of a few of them, believing that I shall be able to explain satisfactorily the cause of a colored variety of the pea having been apparently changed into a white variety by the immediate influence of the pollen in the experiment of Mr. Goss.

Other papers he contributed were: "On the Comparative Influence of Male and Female Parents on Their Offspring;" "On the Hereditary Instinctive Propensities of Animals."

Mr. Knight lived a rather retired life, being almost shy of people, except when he met with minds similar to his own and engaged in similar work. He had friends among the most noted scientific men in Europe and with them carried on a voluminous correspondence. He was elected Fellow of the Royal Society in 1805.

A STUDY IN EUGENIC GENEALOGY.[a]

A. GARTLEY

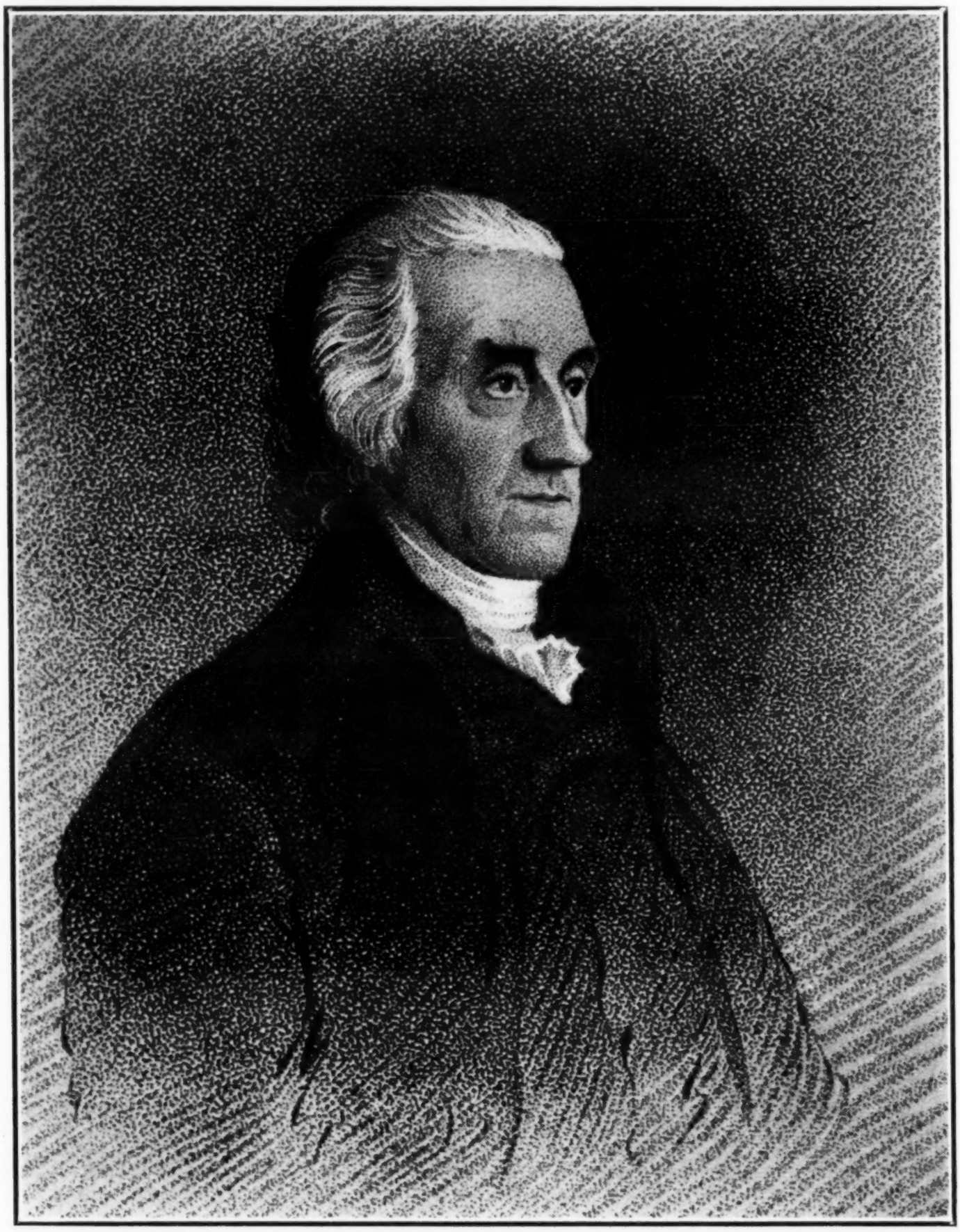
Honolulu, Hawaii

Two other of the descendents of Elizabeth Tuttle, through her son Timothy, have been purposely omitted from the foregoing catalogue since they belong in a class by themselves, because they inherited also the defects of Elizabeth's character. These two were Pierpont Edwards, who is said to have been a tall, brilliant, acute jurist, eccentric and licentious; and Aaron Burr, Vice-President of the United States in whom flowed the good and evil of Elizabeth Tuttle's blood. Here the lack of control of the sex impulse in the germ plasm of this wonderful woman has reappeared with imagination and other talents in certain of her descendants.

The remarkable qualities of Elizabeth Tuttle were in the germ plasm of her four daughters also: Abigail Stoughton; Elizabeth Deming; Ann Richardson, and Mable Bigelow. All of these had distinguished descendants, of whom only a few can be mentioned here. Robert Treat Paine, signer of the Declaration of Independence, descended from Abigail; the Fairbanks brothers, manufacturers of scales and hardware, and the Marchioness of Donigal, were

[a] Continued from vol. iii, no. 4.

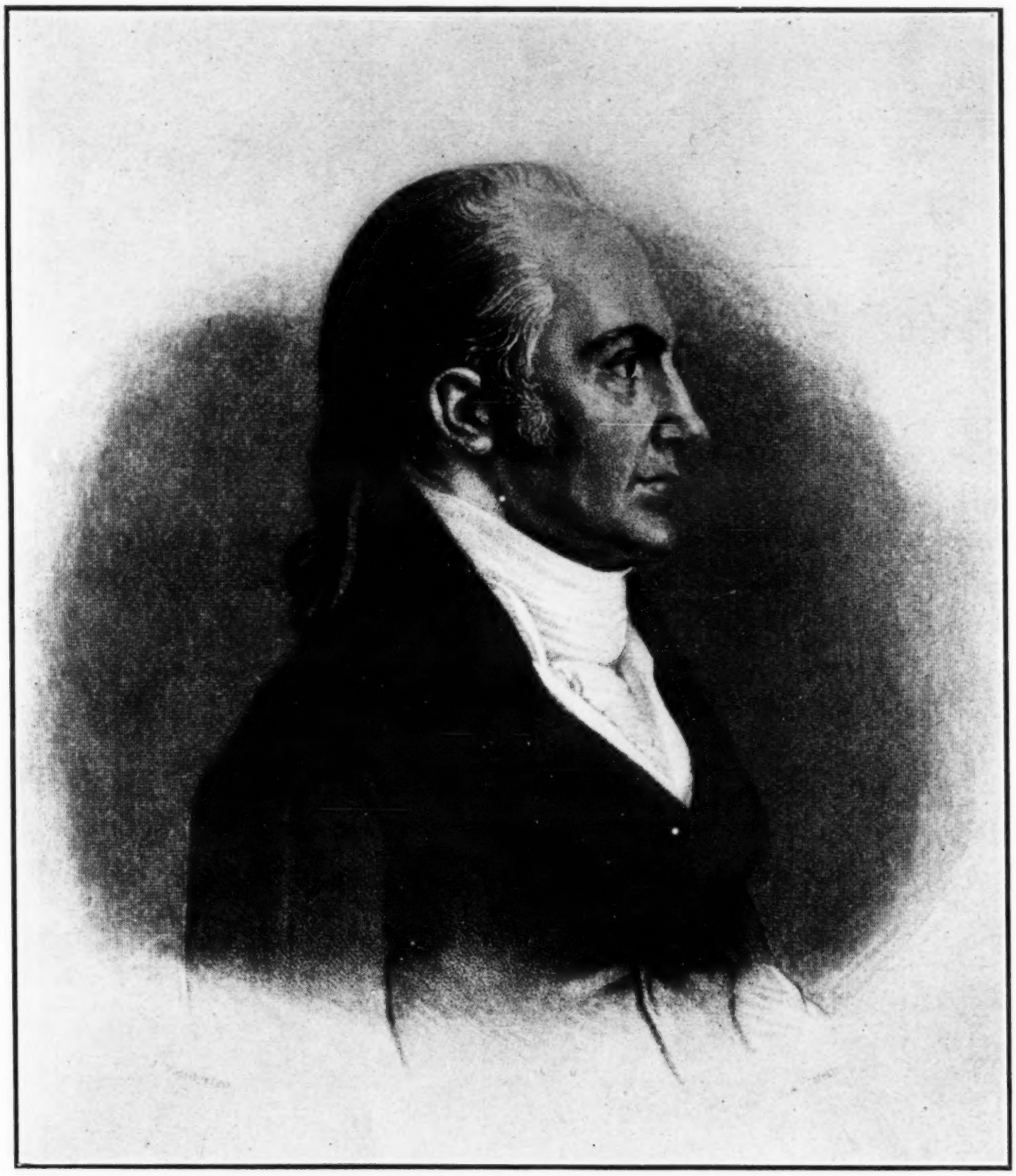
descended from Elizabeth Deming; from Mable Bigelow came Morrison R. Waite, Chief-Justice of the United States, and the law author Melville M. Bigelow; from Ann Richardson proceeded Marvin Richardson Vincent, professor of sacred literature at Columbia University; the Marchioness of Apes-



ROBERT TREAT PAINE

tiguia of Cuba, and Ulysses S. Grant and Grover Cleveland, Presidents of the United States. Thus two presidents, the wife of a third, and a vice-president trace back their origin to the germ plasm from which (in part) Elizabeth Tuttle was also derived, but of which it must never be forgotten, she was not the author. Nevertheless, had Elizabeth Tuttle not been, this nation would not occupy the position in culture and learning that it now does.

Furthering of the productivity of the fit must come through education in the subject of heredity and the encouragement and promotion of a public sentiment favorable to the determination and recording of the value of each individual as a progenitor of healthy



AARON BURR

generations and the racial breeding value of each family and strain. This knowledge at hand the normal person can with perhaps a word of advice from a trained eugenist, choose a mate and produce only normal children.

A word concerning the checking of the birth-rate of the unfit. The establishing and recording of potentially weak strains will result

in genetic ostracism which will reduce their fecundity, while strains marked by dangerous defects and by anti-social traits must be rendered harmless by isolation or when necessary, by sterilization.

The problem is not a monumental one, for the anti-social unfit amount to but 2 or 3 per cent of the population. This comparatively small percentage brings us into intimate contact with crime, degeneracy and disease so seldom that we have become accustomed to ignore it or accept it as a necessary evil until our sympathies and indignation are as deeply aroused as they were recently when Judge Whitney presented but a few of the pitiful cases he has met in his admirable and humane social uplift work. Then we are so filled with sympathy and good intentions that we choke as we ask, "What can we do?" Many measures of relief are only temporary and David Starr Jordan has said "Charity creates the misery she tries to relieve; she never relieves half the misery she creates."

This 2 or 3 per cent of delinquents, deficients, and dependents bring us more unhappiness and misery and are a greater drain on society than their numbers would warrant. All our criminal law and the huge machinery of its execution and our costly institutions for correction and detention are for their benefit and are heavy drains on our energies, finances, and sympathies. We inquire, "Were it not better they should not have been born?" Our civilization tenders them such fostering care and has placed so few restrictive measures on their reproduction that it is breeding the race downward, and we are confronted by the appalling fact that the fecundity of the unfit is vastly greater than the normal average and that they are increasing, notwithstanding they perish in great numbers due to the lack of proper nuture. Furthermore, our present social standards tend to sterilize our strong and desirable strains and reduce their fecundity below the average. The principle of the survival of the fittest no longer applies, for we are rendering no aid to the fit and are carefully fostering and promoting the survival of the unfit. True, our criminal laws are made to prosecute and destroy many who are sick in body, mind and morals. England, for instance, no longer lops them off in such great numbers as she did a century or so ago when she had 215 capital offenses on her statute book.

What result to our national welfare may be expected? Is it not time that we strike at the root instead of lopping off the branches? We have with us in Honolulu all known social and economic problems, somewhat intensified perhaps, by our insularity and our mixed population. It is therefore necessary that we intelligently apply every

known means of increasing our social welfare. Attention should be directed immediately to the problem of our so-called non-leprous children and the application of eugenic principles to the admission of incoming aliens.

ULYSSES S. GRANT

One of the rights of a state is to exclude mentally, morally, physically, and economically undesirable aliens, and although our United States laws are long and formidable they have not succeeded in excluding a defective and degenerate element and the eugenically unfit. During some periods the administration of the law has been lax and inadequate and ineffective measures of enforcement have greatly added to our already too large numbers of insane, feeble-minded, degenerates and those afflicted with or prone to contract

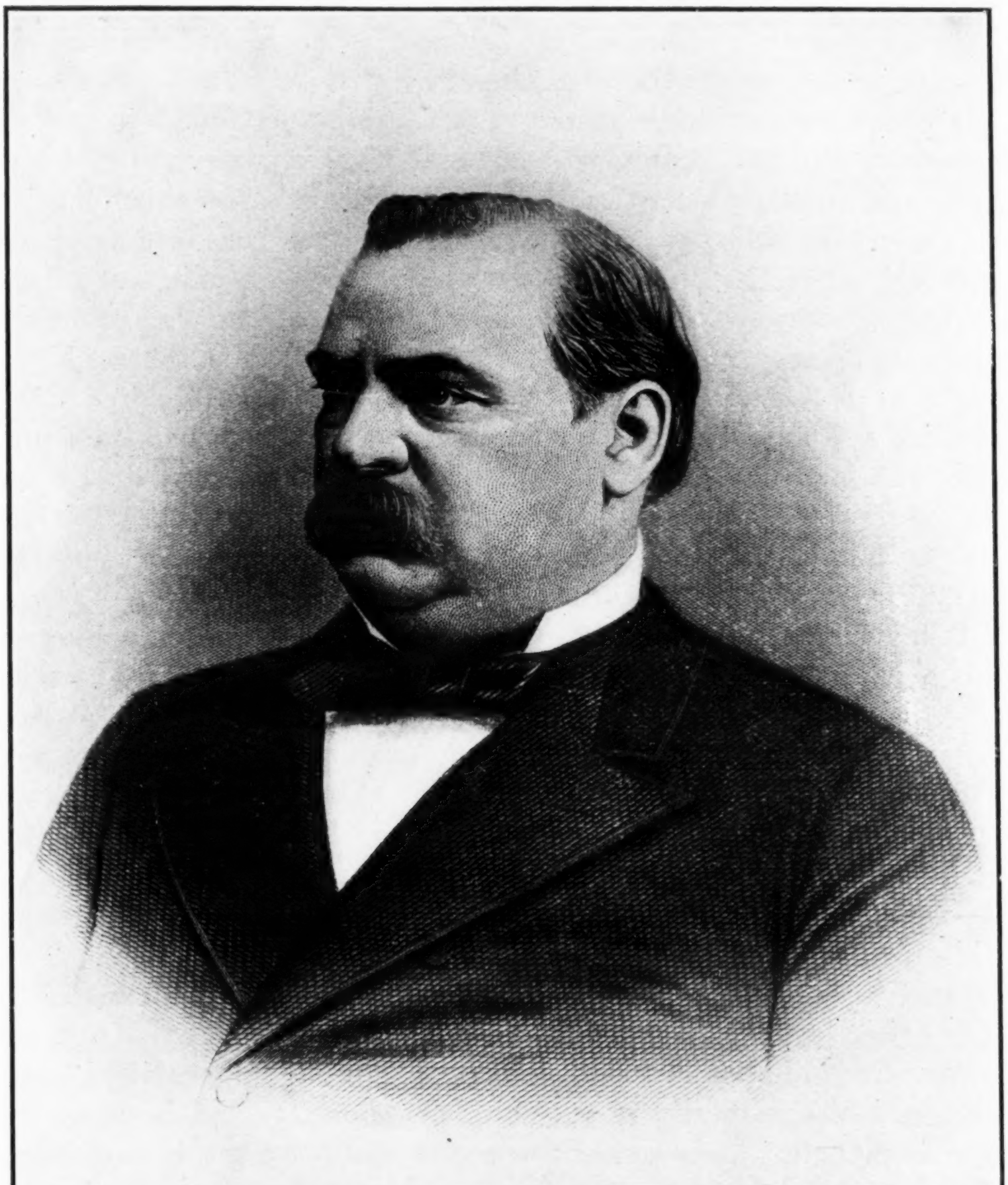
dangerous, contagious and loathesome diseases. We have left the choice of the alien, and the shaping of the laws admitting him, too much in the hands of purely commercial interests. Steamship companies reap their benefits from, and are therefore interested in, the numbers that can be induced to travel on their vessels, and the pitifully inadequate fine imposed for bringing in the unfit alien is insured by a deposit made by the alien himself.

The law itself which excludes persons "who are found to be and are certified by the examining surgeon as being mentally or physically defective, such mental or physical defect being of a nature which may affect the ability of such alien to earn a living" has been rendered partially ineffective by being construed as an economic test rather than a physical one and accordingly the filing of bonds has admitted many an alien of poor physique, low vitality, non-resistant to disease and the potential parent of weak and dependent children. We appoint and maintain agents and inspectors to investigate and prohibit the importation of defective or infected cattle and encourage the admission of the better strains. Should we not exercise equal care in admitting human beings? The duty of those in charge of our ports of immigration is clear.

I have only outlined a bare skeleton of the many principles of this new science and already my paper is too long. I cannot forego a prediction as to the place the science of eugenics will occupy. Each generation or century produced results proportional to the concentration and application of its great minds, be it in scientific achievements, arts, literature, or religion. In the latter half of the past century the concentration on the sciences has resulted in physical achievements and an accumulation of knowledge and social responsibilities far in excess of the total of all previous centuries. This generation has advanced far ahead of the normal standard of society of previous generations and the individual of each succeeding generation finds himself surrounded by a mass of ever-increasing knowledge and responsibility, in excess of his capacity, and he longs for the simple life. It is evident a social readjustment is necessary. If the normal human capacity can be increased each generation by ever so narrow a margin and desirable determiners introduced, making education and moral and religious instruction more valuable, or less necessary, a complete social adjustment will be possible and permanent progress be made.

During this century the concentrated effort of our greatest minds, will be directed to the development of our race, and eugenics, social

adjustment, and education will coöperatively produce results which will transcend any produced by the uncontrolled evolution of the past 60 centuries. It is the duty of every thinking citizen interested in social welfare and advancement to keep pace with the advancing



GROVER CLEVELAND

eugenic knowledge, and keep in mind the following last paragraphs of Galton's Memoirs as these are a summing up of a lifetime of study and experience in eugenics.

Charity refers to the individual; statemanship to the nation; eugenics cares for both.

It is known that a considerable part of the huge stream of British charity furthers by indirect and unsuspected ways the production of the unfit; it is more desirable that money and other attention bestowed on harmful forms of charity should be diverted to the production and well-being of the fit. For clearness of explanation we may divide newly married couples into three classes, with respect to the probable civic worth of their offspring. There would be a small class of desirables. It would clearly be advantageous if social and moral support, as well as timely material help were extended to the desirables and not monopolized as it is now apt to be, by the undesirables.

I take eugenics very seriously feeling that its principles ought to become one of the dominant motives in a civilized nation, much as if they were one of its religious tenets. I have often expressed myself in this sense and will conclude the book by briefly reiterating my views.

Individuals appear to be as partial detachments from the infinite ocean of Being, and this world as a stage on which evolution takes place, principally hitherto by means of natural selection, which achieves the good of the whole with scant regard to that of the individual.

Man is gifted with pity and other kindly feelings. He has also the power of preventing many kinds of sufferings. I conceive it to fall well within his province to replace natural selection by other processes that are more merciful and not less effective.

This is precisely the aim of eugenics. Its first object is to check the birth rate of the unfit instead of allowing them to come into being though doomed in large numbers to perish prematurely. The second object is the improvement of the race by furthering the productivity of the fit by early marriages and healthful rearing of their children. Natural selection rests upon excessive production and wholesale destruction; eugenics on bringing no more individuals into the world than can be properly cared for, and those only of the best stock.

THE FARM, THE HOME OF THE RACE[a]

W. M. HAYS

Washington, D. C.

The Farmers' National Congress is hardly the place for a technical paper. I therefore must apologize for a rather technical introduction to a subject somewhat new to the Congress, that I may discuss briefly one of the broadest general questions connected with the open country and with our national life.

In presenting this subject I come primarily as the representative of the American Breeders Association and only incidentally from the National Department of Agriculture. My theme deals with a subject that is parallel in importance with our greatest economic problem, the fertility of the soil. The laws governing the breeding of plants and animals, when applied to the betterment of the inherent or

[a] Address delivered before the Farmers' National Congress at its annual meeting at New Orleans; Louisiana, November 7, 1912.

genetic agencies which largely determine human efficiency, rectitude, and happiness, are only beginning to receive attention. Scientists are only beginning to have large faith in the application of the laws of heredity to the human family. Our educators and preachers are only commencing to think how much easier their tasks will be when all people inherit only normal and efficient qualities. Our philanthropists are only beginning to realize that we are allowing the weak to be born, and then supporting them in their incompetence, disease and crime. Our statesmen are only beginning to see that part of the public money and effort expended on almshouses, homes for feeble-minded, insane asylums, prisons and other eleemosynary institutions would better be devoted to a study of human heredity and the formulation of such policies as would lead to a smaller number of births among defectives.

Statistics tell us that we expend more than 10 per cent of our productive income on those weaknesses, vice, and diseases which depend in large part on defective heredity. And along with this loss of wealth is suffering, grief and despair of a character and amount not known even in war. Surely a small percentage of this vast expenditure should be spent in studying heredity, which is the basis of our bodies and of our very souls. Manifestly the triumvirate, education, religion and eugenics, must coöperate in building up a greater race.

The open country has two main functions: The production of raw products of food and clothing for the whole people; and the support of farm folks in such a substantial way as to induce the best of them to permanently live on the land and to have healthy and large families, that their virile blood may dominate the whole race. The food problem is the immediate one, but even at the risk of being called visionary I shall briefly outline why the genetically efficient people should be especially encouraged to rapidly multiply, that they may gradually take the place of the less efficient stocks.

The American Breeders Association, through its Eugenics Section, so far holds the attitude mainly of investigator rather than that of teacher. Its efforts have been expended to find the facts, to avoid quackery in eugenics and to discover what the limitations of the field of human breeding are, and wherein lie its practical phases. To bring this subject to a scientific status it is organizing a force of technically trained investigators. Already twenty persons are continuously employed in recording the genetic characteristics of families. The several thousand families already studied represent those

human stocks in which hereditary mental defects occur, but normal and unusually brilliant families are also included.

Thousands of experiments have verified the cross breeding experiments from which were deducted the laws of Mendel. Most of the newer facts concerning heredity have been wrought out through experiments with plants and animals. But sufficient studies have been made in human heredity to show that the laws which apply to heredity in these lower forms apply in practically the same way in the human family. Mendel has thus led us into a formal and mathematical way of looking at the elements which go to make up the heredity of an individual or of a race. Blue eyes or brown eyes; light hair or dark hair; tallness or shortness; a Roman nose or a straight nose; ability in music or the lack of such ability; ease in learning mathematics or dullness in mathematics; a cheerful disposition or a sober disposition; lack of resistance to tuberculosis or immunity to this disease; and a thousand and one other characters act in heredity as units much more definitely than we have generally believed.

There seems to be a heredity carrier in the generative cell for each unit character. These carriers have great power to keep themselves intact, whether the unit be the blue eyes, the Roman nose, the cheerful disposition or other characteristics which plunge through successive generative cells and come up dominant or are dormant in a given generation. How those carriers which appear to be absent or remain dormant during one or more generations, may again be given expression in a future generation with power to come up as an unmodified unit, is the marvel of heredity. Thus in the union of parents with similar unit characters, as well as in the union of parents somewhat dissimilar, and also in the union of parents radically dissimilar, we find these unit characters operating much as the fibers woven together into a fabric in the loom with much system in the weaving of the fabric.

Modern genetic science, based on the work of Mendel and other investigators, centers eugenics science, or the breeding of races of men, about unit characters.

It is not strange that this new science gives man vastly more power in the breeding of plants and in the breeding of animals than in the improvement of his own race. It is not strange that the practice of eugenics is restricted to very narrow limits indeed. The long life of the individual, only one child at a birth, relatively few children, and various social customs, considerably restrict those radical

selective processes such as may be practiced in the improvement of the heredity of plants, or even of animals.

True, we can hope to eliminate gradually the larger portion of those families which have in their network of descent fibers of feeble-mindedness, insanity, or other weaknesses so pronounced as to make the individuals into whose being these unit characters are woven a heavy burden upon society. It is probable that methods even more generally applicable than segregation may be advised for the prevention of child bearing by these least efficient stocks of people. But those who are experienced in plant and animal breeding, realizing the limitations in eugenics clearly recognize that the remnants of these weak fibers will be bred out only with great care and through many generations of common-sense effort. It may be said, though, in passing, that the mere elimination of most of our 4 per cent defective and criminally inclined classes, will alone amply repay for all public and private cost that is likely to be expended.

The fact that in some of the civilized nations nearly ten per cent of the marriages are so unfortunate as to terminate in divorce, would indicate that marriage is entered into with less precaution than formerly and that we are both unscientific and inefficient in our plans of choosing helpmeets. It may be said that genetically not more than 25 per cent of our human matings are as wise as might be if the contracting parties could make their choice with full genetic information.

The philosophy of the old expression of the stockman who sought the proper "nicking" of his animals, has in Mendelism found an explanation. If two feebleminded people marry, all the children will be feebleminded. If two persons from families not resistant to tuberculosis marry, a large percentage of the children will in most cases be more or less predisposed to this disease. If, on the other hand, a normal person in whom there is, in recessive form, some hidden fiber of feeblemindedness is married to a person in whose family there are no feebleminded fibers, the immediate progeny will be normal. In other words, in many cases with full genetic data of both families in hand, the scientifically trained eugenist can give fairly accurate advice as to the probable proportions of defective or normal progeny from a given mating, and thus can advise against matings where the chances are that a part of the children will inherit unfortunate characters. Enough of the theoretical basis is already known to make it sure that science will eventually and very materially help in human matings.

Detailed facts concerning general efficiency values and dominance of unit characters in the heredity of persons, including those characteristics which result in inefficiency, are not as yet available except in case of a very few families. The common folk-talk and personal knowledge at present furnish the only guide to persons who contemplate marriage, and this information is often too meager for judgments which are just to the future generation. If the general efficiency of each individual, and also his or her efficiency or deficiency along any specific line in which there is deviation from the normal, were recorded; and if these records of individual values were so tabulated as to give genetic values and were worked out as is done in breeding such plants as corn or cotton, our knowledge of family values would be fairly accurate and definite. The basic information would be such that in questionable cases careful study could be made by the individual or by some persons trained in genetics that the interested person might select. A case recently came to my notice in which a young couple, desiring to enter upon matrimony, consulted an eugenist concerning their case. The troublesome fact was that the young lady's maternal ancestors for three generations had been seriously afflicted with mental illness at about a given age. Upon the advice of the specialist the young couple agreed to postpone marriage for a year, pending a careful investigation of the heredity of both families.

But the large facts regarding the weaving of the stronger, cleaner, more efficient network of descent for the human family must be approached also from another angle. It is not always true that like begets like nor that the best begets the best; but it is true that the genetic like begets like, and the genetic best begets the best. There are three major phases of the practice of eugenics: First, the elimination of the genetically very inefficient; second, the prevention of matings which may perpetuate weakness in the race; and, third, the production of relatively larger families by the socially and individually efficient, advocacy of relatively smaller families by the less efficient.

If these propositions be true, the open country and the farm home take on a new racial significance beyond anything heretofore considered. We are accustomed to look upon the farming business as both the substantial basis and the balance wheel of our national economic prosperity. We have looked upon the electorate in the open country as the support of every meritorious forward political movement, and at the same time as the great conservative agency

in both social and political questions. We have come to look to the open country as the source of fresh blood with which to keep up the vitality of our city life, as the main conservator of the physical development of the race and of the nation's moral and religious life.

This is in no small part a country life problem. Until recently—historically speaking—nearly all the people of the race lived in the open country. Sixty to ninety per cent of the population were engaged in procuring food and clothing. The heredity of the human family has been wrought out through ages of open country life. During the last two or three generations a great change has taken place. Those civilized nations which are utilizing steam and electrical transportation, have devised wonderfully efficient and complex machinery for production and distribution, and have developed their home making into a science and an art, and only one-fourth to one-third of their populations are engaged in tilling the soil and in making their homes in the open country. Thus we have those people, now rapidly becoming city-dwelling people, whose heredity, or to use a figure of speech, whose network of descent, was woven for life in the open country.

In considering these particular phases of the relations between country and city life, we have been inclined to overlook some of the counter agencies and influences. We have not given due weight to the fact that we have been reducing the fertility of our soils and have decidely depleted our forests by using forest products three times as rapidly as we are growing them, and that our methods of agriculture are such that production has rather fallen behind population. We have overlooked the fact that there is ignorance, inefficiency, and even corruption in part of our rural electorate, second always to the inefficiency and corruption of part of our city electorate. We also too frequently overlook the fact that along with these, the country furnishes also a very great number of mediocre people. It is true that many of the great moral leaders in our centers of population have come from the country; but it is also true that the country supplies not a few of the crafty men and weak women to carry forward the vices of the city.

Finally, we have not fully comprehended and outlined the ultimate possibilities of the open country in its relations to race building. The open country of the United States is just passing from its pioneer period. It still has the one-room school, the divisive church, and some of the other conditions which leave the organization of country life in a county or state in a jumbled-up condition. There are so

many unrelated and diverse neighborhood centers overlapping each other about schools, churches, stores, villages, and other organizations, that strong community life does not exist in the country except in the occasional district. When the new movement to consolidate the rural schools, which has already covered between 5 and 10 per cent (between 2000 and 3000) of our entire territory, has had time to reach its final development over nearly our entire open country; and when for a generation hence we have annually spent some hundreds of millions of dollars on the reconstruction of our public roads, the value of the open country in relation to race improvement will be even more apparent than now.

Already we have two or three thousand consolidated rural schools. Both Ohio and Indiana have consolidated nearly one-third of their former one-room district schools into these splendid country life schools, each has several hundred of them. It seems assured that thirty to forty thousand consolidated rural schools are destined eventually to take the place of two or three hundred thousand one-room schools in the United States.

In thus enlarging the area of the school district from the walking limit, of two miles square, to the team-haul limit of five miles square, public school vans are provided which can also be used to assemble the youth or adults in meetings for other purposes, social, economic, political, or even religious. Since through such realignment all the people of the school district will come to know each other intimately, during their school days, there will be a strong tendency for the church and other community institutions also to center beside the consolidated rural school, whether it is in the village or in the open country. An agricultural county with fifteen compact communities, each containing five to fifteen hundred people all trained to coöperate, will become unified in all kinds of activity. Educational, social, economic, and political purposes can here be accomplished in a democratic way. Leaders will be chosen to express the will of the community and to coöperate with similar leaders representing the other communities of the county, and thus country life leaders will grow up. Thus the interests of the county will be federated to act as a unit with federations in other counties. State organizations will naturally federate the organizations of all the counties, and in turn a great national federation, such as is proposed at the meeting of this Farmers' National Congress, will be the logical result at the top.

The farm and the farm home are the elemental institutions upon which country life organizations must rest. By the mere physical act of consolidating the rural school districts into large districts in which all community activities are centered and unified, the basic action is taken to make country life over. This one feature of reorganizing country life will make it possible to provide the supplemental institutions within reach of the farm home which will give the necessary support, outlook and opportunity to the farm family. In and through the consolidated rural school district, most of the coöperation and help needed from the outside, from the national and State departments and from other institutions and organizations can be supplied to the farm and the farm home.

The consolidation of the rural schools in rural America is a vastly more important and far-reaching proposition than any contemplated changes in our tariff laws. If done properly, and if the full possibilities of country life reorganization are kept in view in these new districts, and if our public roads are improved, as eventually they will be, the family farm will even become vastly more important to the nation than now. Not merely the few best farms, but all farms will become places for people of good heredity who will thus seek to remain on the land as the best places for a large family life. The consolidation of our rural schools is the one great important and paramount country life problem of every rural community and of the nation.

In the county in which I live, Montgomery County, Maryland, beside the District of Columbia, there should be say seventeen consolidated rural school districts, each with a territory about five miles square. This would provide for seventeen teachers of agriculture and seventeen teachers of home economics, or thirty-four technical teachers in all. If, in addition to this, the county superintendent, the assistant county superintendent, a county farmers' bureau expert, and a county farm home expert, besides secretaries of the Y. M. C. A. and Y. W. C. A., were all trained in the manner suggested above we should have in the county a technical force of about forty people. These would not be added workers. They would be a portion of the former teaching force required in the one room schools trained for special work while the whole number of teachers would be reduced. When we look about and see the marvelous results which have come from the relatively few people now at work in our agricultural colleges, experiment stations, and

departments of agriculture, may we not hope for ten or twenty times larger results when the new sciences of agriculture and home economics are brought home to the people of each county by such an organization of people thus trained and experienced?

Under these conditions, where all the farm youth are trained for the management of farm homes, may we not expect that the large estate, which too often means a laboring class of semi-peasant type, shall give way to a group of family farms, owned and worked by the farmer and his family, as is the case in most of our great country?

Those acquainted with life in the open country can best picture for themselves the attractiveness of country life when the farm, the home, and the community are properly organized, equipped, and better supplemented by community organizations. Then will not the security of the country rest doubly safe on an intelligent rural electorate? Then cannot the home, the school, the church, and the young people's Christian associations unite in team work in the building of characters which will assure private and national honor in all things.

The open country is the best home of the race as country and city are now constituted. When the country shall have been built up and developed and the race bettered physically, intellectually, and genetically, the open country will continue to be the best place for the best of the race, that the best may so multiply as to become the whole of the race.

The state and the nation should do more for the open country, but not in a paternalistic way. All help from the outside should be in the nature of coöperation. It should always be given under conditions which will lead to local support and effort. There is grave danger of paralyzing local activities by supplying too much from the outside. But possibly the largest danger is that we shall fail in that happy coöperation between the general and local agencies which will get the needed work done. The development of the open country is a mighty work needing large efforts on the part of all available agencies.

Country life education and organization such as is coming forward is laying foundations to greatly increase the number of excellent farm homes and the number of strongly developed country-young-people. We have done much to produce wealth and to increase economic production, and I believe we are approaching an era in which we shall broadly combine with the production of food, systematic and extensive efforts to build up the farm home and the commu-

nity social life of the open country, and the production of a country people among whom greater efficiency will be based on both superior blood and superior education.

The inefficient and the unfortunate who have neither earning ability nor productive capital, are in a crowd, the pace of which they cannot keep. The free food, clothing, fuel and material for shelter of the past are fast passing into the hands of active, efficient producers, and among those into the hands of a capitalist class. The person today at the bottom of the economic scale has the hardest time ever. Families and portions of people subsisting by charity are becoming impossible as a racial asset. Only efficient people have a place in the new times. Science demands the improvement of the race, both eugenically, and eusthenically, that is both by heredity and by improved environment.

The organization of the open country, the villages and the suburbs into the best places for motherhood and fatherhood, is a great national duty and opportunity.

This Farmers' National Congress has before it a proposition to so amend its constitution as to make of it at once the greatest agricultural society, the greatest country life federation, because we have a remarkable body of farm people. If there were no other reason but the eugenic purpose of thus uniting in one powerful coöperative association all people who believe in farm life, that would be ample cause for making this a highly developed and efficient organization.

And why should not my suggestion of a year ago, in the address introducing the proposed new form of constitution for this Farmers' National Congress, be followed, and the new Country Life Federation join with other like federations of other classes of people. A great American Welfare Federation, uniting in one powerful federation, the national organization of farmers, women, laborers, manufacturers, Y. M. C. A., and Y. W. C. A., workers, genetists, educators, scientists, conservationists, home makers, artists, peace advocates, and altruists generally would learn to express the clearest vision of the best thought of the whole people on the largest and most important problems of our beloved country. Such organization could hold in abeyance the clouds of war, could help bring unity of thought and action concerning the liquor question and its expressed will would be felt in favor of a broader education and a wider spirit of individualism in coöperation.

The spirit of coöperation and unity displayed in the deliberations concerning the making of the Farmers' National Congress a great

national country life federation will commend itself to all the associations, institutions, and departments which the proposed constitution would invite to adhere and be represented by sending delegates to the national federation. The power which these constituent organizations will bring to the federation will prove to be marvelous. Our special and general country life associations, our agricultural colleges, experiment stations, and departments, including our farm women's associations and institutions, will supply trained and seasoned leaders, which in this general organization will find opportunities to help crystallize and put forward the mighty things to be desired by our great farm people.

Nowadays a decade witnesses the culmination of accomplishments larger than were achieved during the entire century recently closed. May it not be that the building up of the open country so as to build up the heredity of the races of man is to be at least one of the achievements of the twentieth century?

Truly the proposed new Country Life Federation has before it more problems than the increasing of the products of the soil. It can help to produce a new civilization based on truly efficient people.

HORSES AND HORSE BREEDING

H. K. BUSH-BROWN

Washington, D. C.

It is a curious thing that fossil remains of the horse are found on this continent where the race had become extinct ages before its discovery by Columbus. On the other hand the living horse is indigenous to Africa, Europe or Asia, but as to just where, authorities differ greatly.

Whether all horses living are of one family or may be divided into four families or more, is perhaps of little interest to the breeder. He has his own ideas of differentiations as he sees them. No matter how insistently science may claim a common ancestry for the horse no breeder will ever recognize the zoölogical law to such an extent as to try to breed draft horses from Shetland ponies, for instance. If, as some claim, these wide differences of type are largely of man's selective creation, so much the more important it is to study them, if the breeders are to take advantage of variations in creating still other types adapted to the needs of man. In this connection I

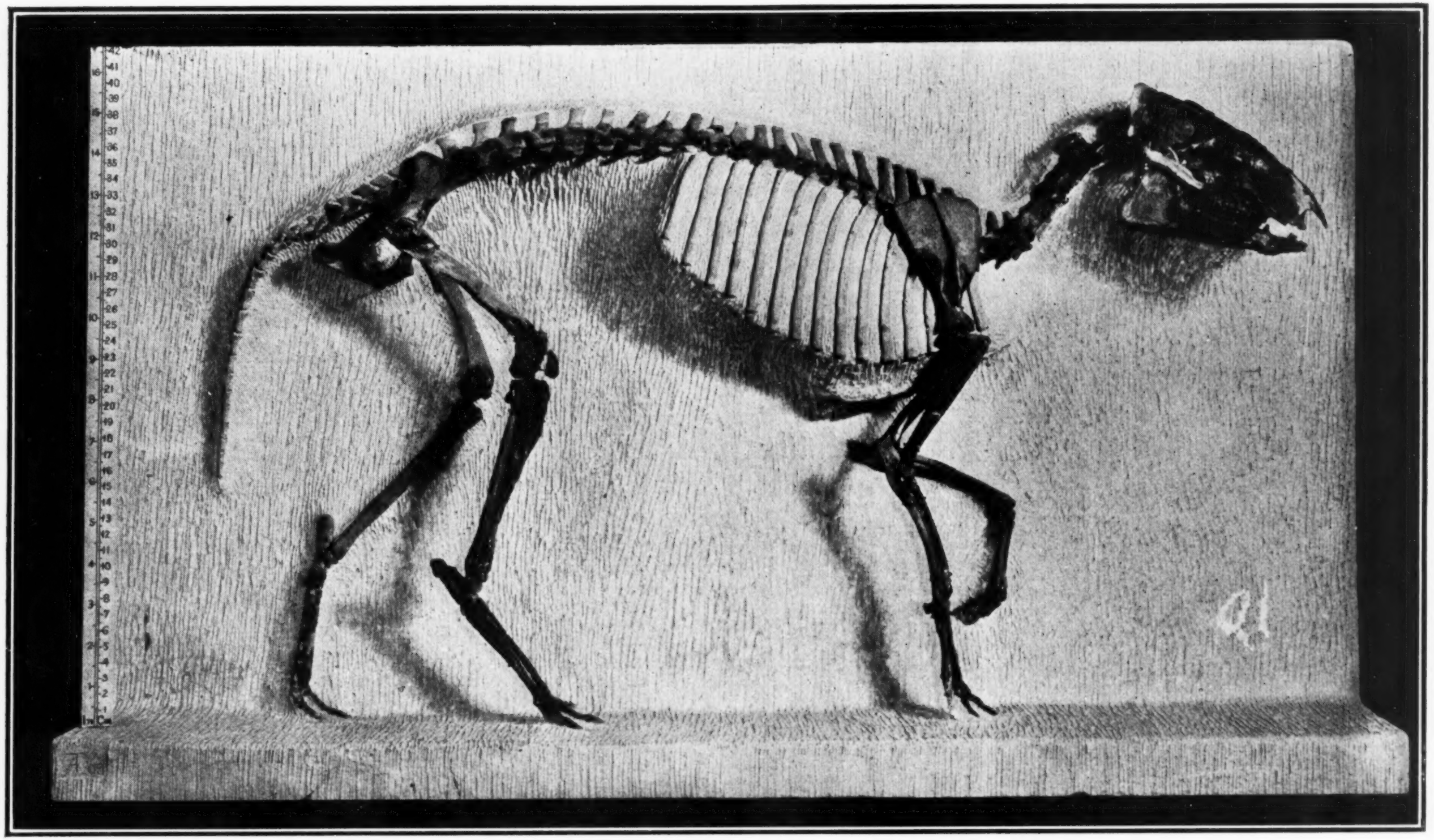


FIG. 1.—OROHIPPUS OSBORNI.
Three-toed horse, Middle Eocene, Wyoming.

would ask for a continued study of anatomical variations that are known to exist, for in the process of evolution of the horse, nature has done and is still doing some interesting things with the bony structure of that animal.

Great was the excitement in the field of science some years ago when Prof. O. C. Marsh of Yale discovered in rock strata on the western ridge of our continent fossil remains of a three-toed and a four-toed horse. If we look carefully at these specimens now in the Museum of Natural History in New York, we will find that the three-toed horse has eight lumbar vertebrae (see Fig. 1); the early

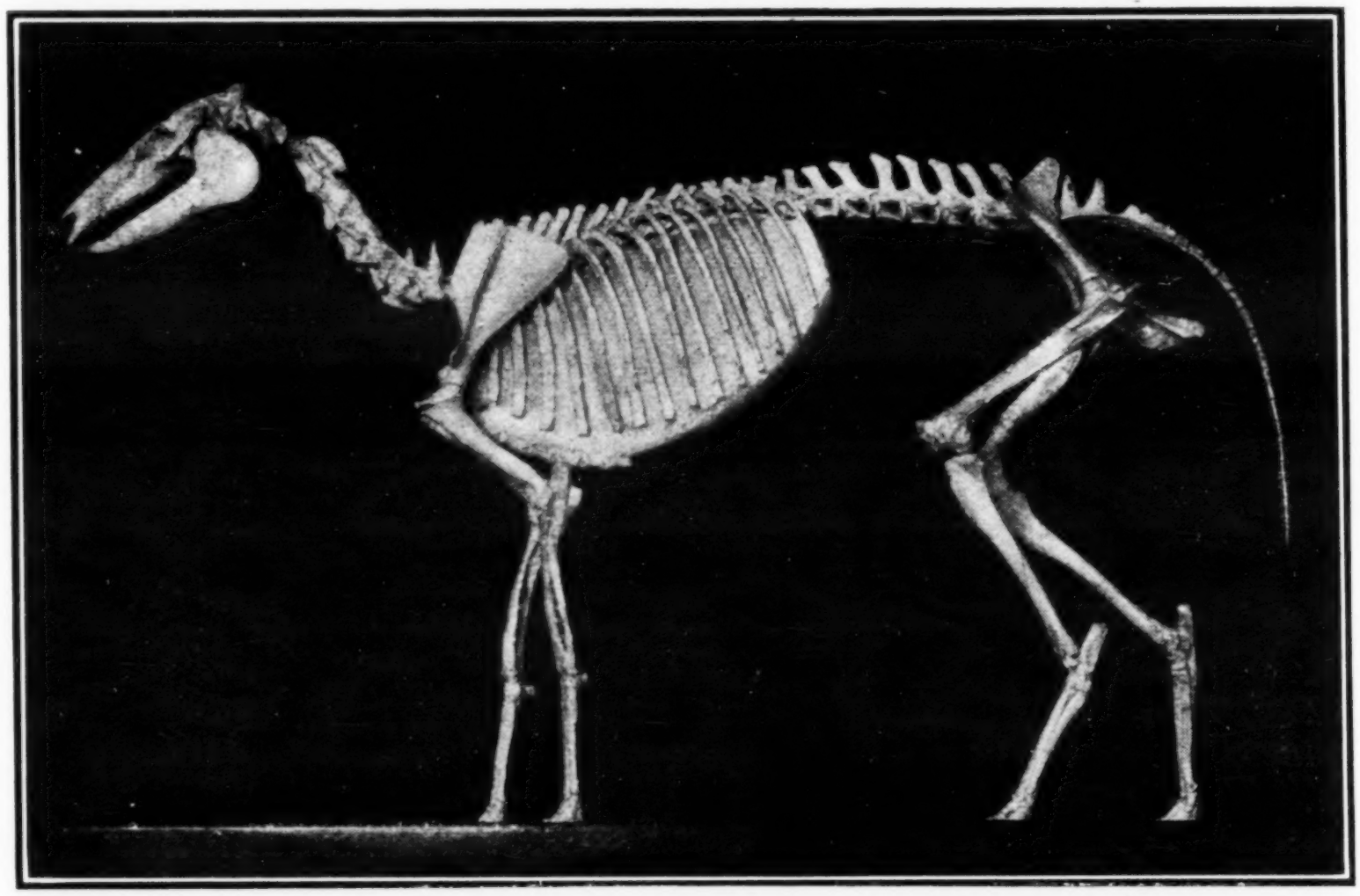


FIG. 2.—MESOHIPPUS BAIRDI.
Three-toed horse, Oligocene Epoch, South Dakota.

three-toed horse seven (see Fig. 2). The Neohipparion, a more advanced three-toed horse, has but six. The fossil Scotti horse found in Texas, six (see Fig. 4); the forest horse of Europe as represented by a skeleton of a Percheron has six (see Fig. 6); Henry Clay, an ancestor of the American Trotters, had six (see Fig. 5); and the Arab horse has only five (see Fig. 10, p. 93, *American Breeders Magazine*, vol. ii, no. 2). Thus the higher the type the fewer the bones in his loins.

Now let us follow in the same manner the bones of the foreleg. Figure 1, the three toes (fossil). Figure 2, the three toes (fossil).

Figure 4 the Scotti horse (fossil),[a]—showing only one toe and the two others reduced to nearly the size of the splint bones of the modern horse. Figure 5 the modern horse, Henry Clay, has splint bones more slender. Apparently here obtains the same law of elimination of superfluous bones as the higher types are approached.

On these lines Mr. Chubb of the Museum of Natural History in New York has made some discoveries that ought to be of interest and of material use to horse breeders. It has been known for some time that occasionally there is found on the foreleg of the horse an eighth carpal in very vestigial form. These carpals are the set

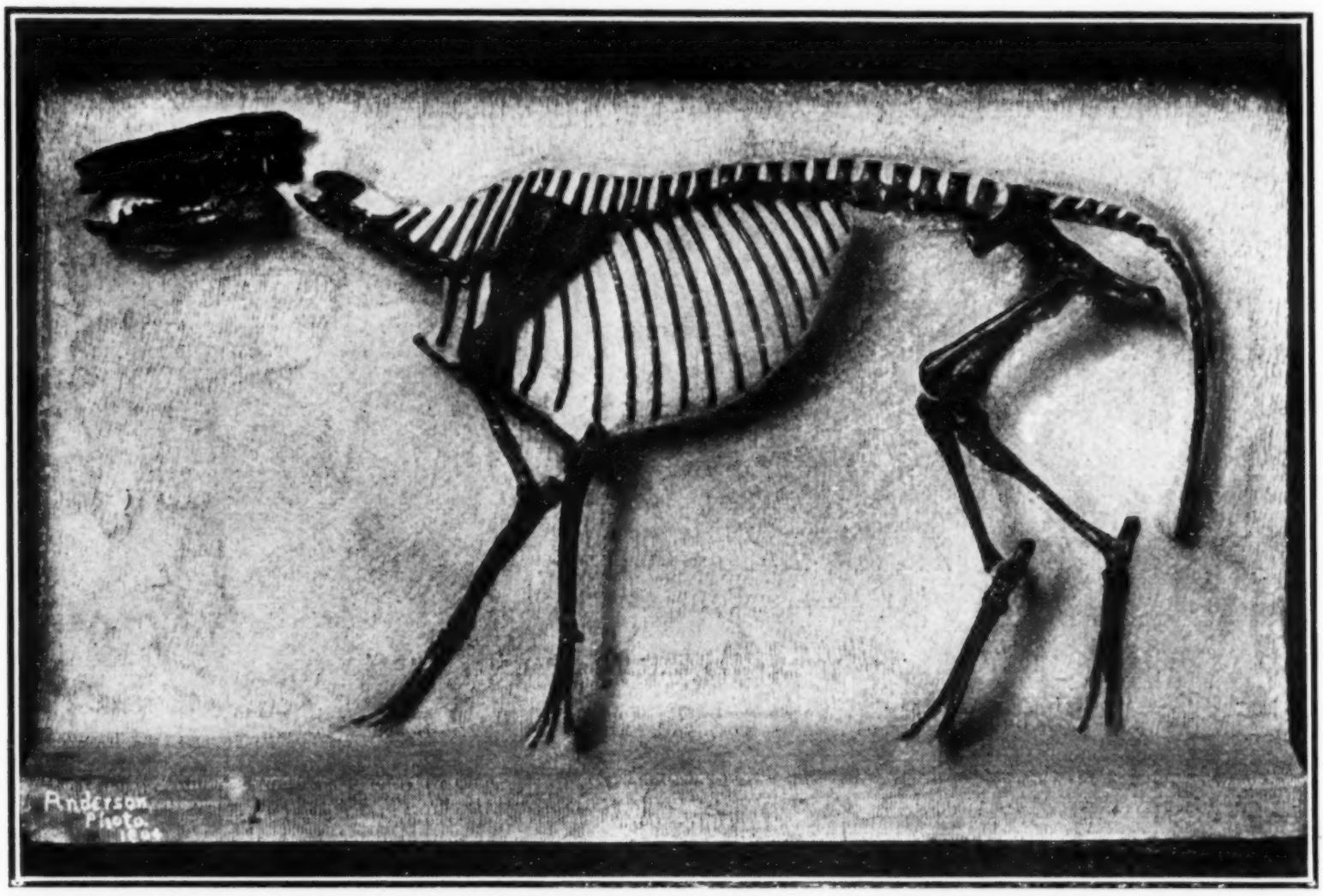


FIG. 3.—EOHIPPUS (PROTOROHIPPUS).
Four-toed horse, Lower Eocene, Wyoming.

next above the cannon bone. The first one in the distal (remote from point of attachment) row is the trapezium bone and is so small that it is difficult to find, being frequently overlooked when it does exist. This bone varies a great deal in size and shape, the largest about three-quarters of an inch long and tooth shaped. Wishing to know something about this little bone, Mr. Chubb obtained a number of horse knees from Barren Island and found the bone pres-

[a] It will be of interest to breeders to know that the fossil remains of the Scotti horse were discovered in Texas by J. W. Gidley. They are skeletons of young horses about a year old as indicated by their teeth, and as they are large for their age they must have been about the size of a draft horse when mature.

ent in 57 per cent of those examined. In one case, however, the bone was so placed that it impinged to such an extent on the trapezoid whenever the knee was bent that an irritation was set up and part

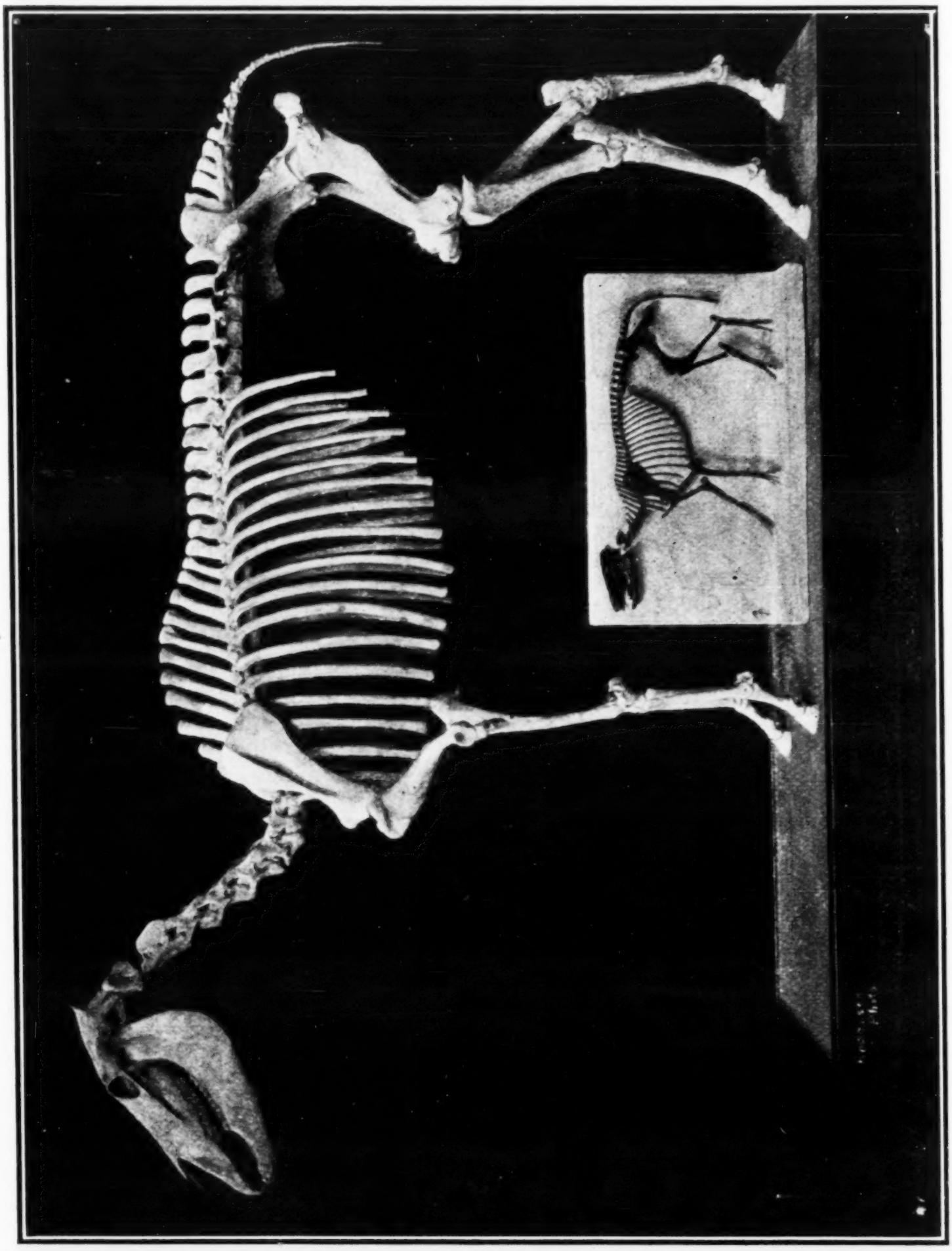


FIG. 4.—THE FIRST AND LAST INDIGENOUS AMERICAN HORSES.
Large, *Equus Scotti*, Pleistocene Period, Texas; Smaller *Eohippus*, 14 inches.

of the bone absorbed in order to make space for the little trapezium. Unfortunately for breeders, Mr. Chubb took his material indiscriminately and made no selection of the several horse types in obtaining his specimens.

It would be very interesting to breeders to know if the law of elimination of this extra bone in the leg prevails with approach to the higher types, as appears to be the case in the vertebrae. Knowl-

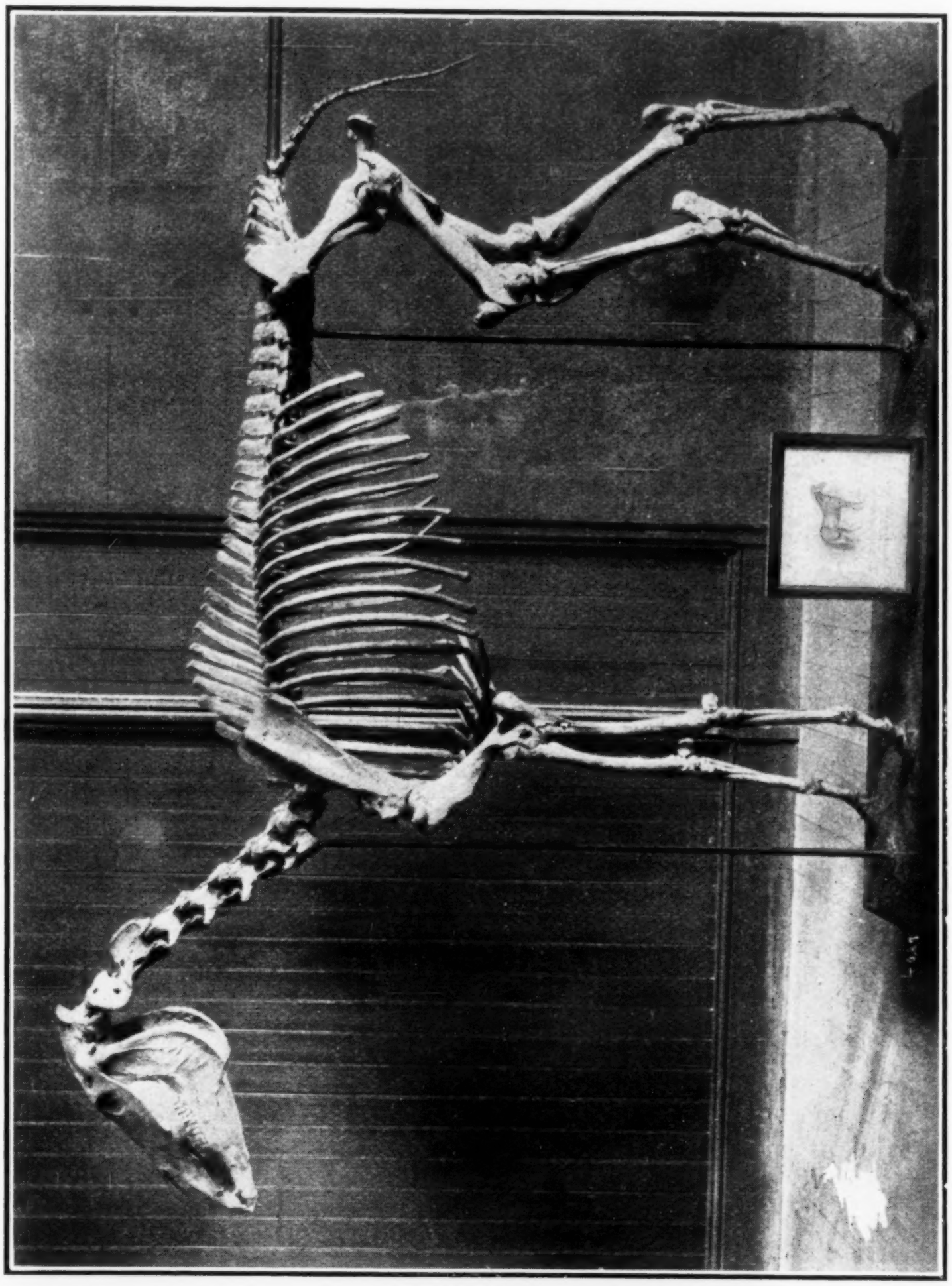


FIG. 5—HENRY CLAY, AN ANCESTER OF THE AMERICAN TROTTER (NATIONAL MUSEUM, WASHINGTON, D. C.).
In the modern high type horse the distance from the ground to the withers is the same as from the front of the buttocks to the shoulders of the body just fills the outlines of a square, that is, the distance from the ground to the withers
This is shown best in the skeleton of the horse Henry Clay. Compare this with the *Scotti* skeleton, Figure 4, which is very long and low in the withers. It will be observed that all the fossil horses have this characteristic, of long bodies, in other words, the horse as he evolved grew not only in size, but grew up in height.

edge on this subject should be of interest to veterinarians and horse breeders, for it is conceivable that if a race horse possessed a trapezium bone so large as to bump on the trapezoid bone every time he folded his knee he would be perceptibly impeded, if he did not in some cases

actually become lame every time he did really severe work. Among the specimens examined by Mr. Chubb he found one with still another vestigial carpal about the same shape and size as the eighth mentioned above. This is the only one on record and it suggests that the evolution of the horse is still going on, and that there are variations which may be individual, or which may belong to one specialized type.

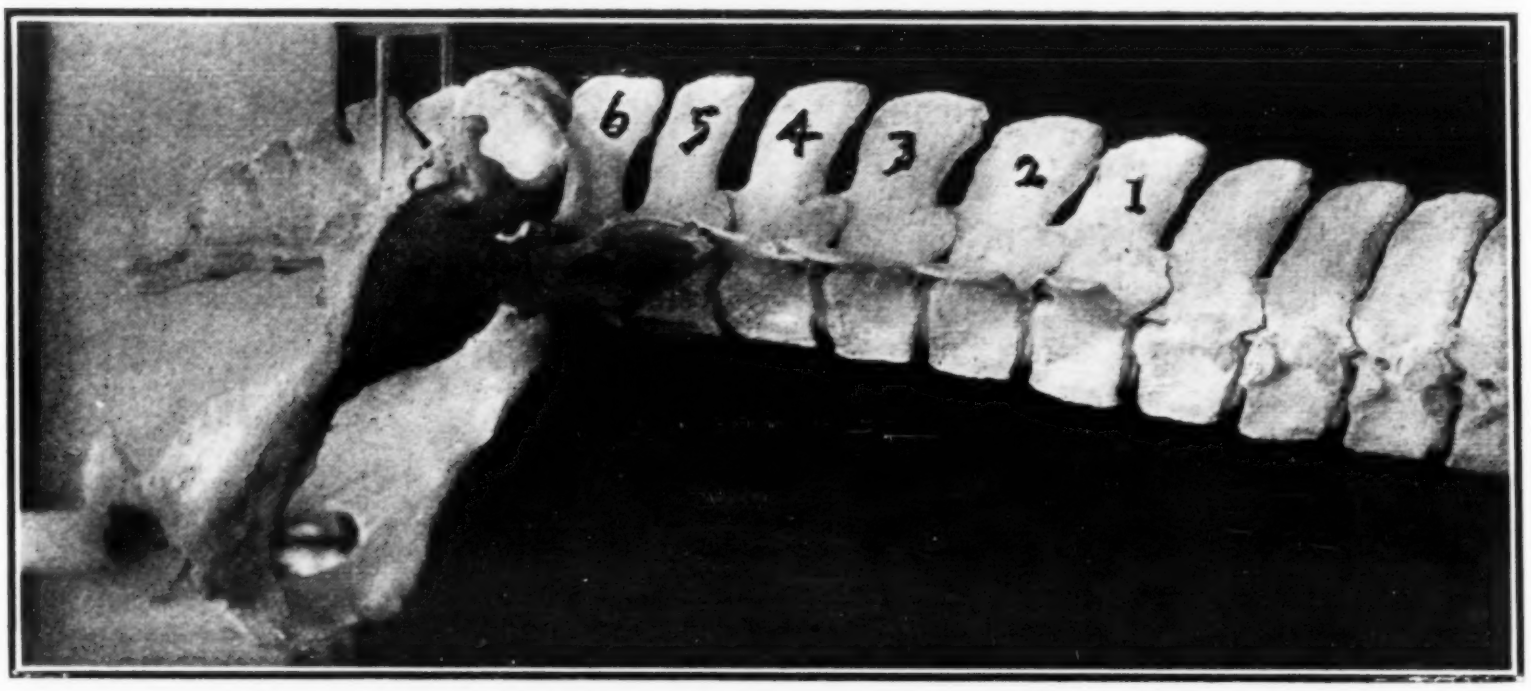


FIG. 6—SECTION OF VERTEBRAL COLUMN OF A PERCHERON HORSE.
Showing six Lumbar Vertebrae. Museum of Natural History, New York.

If societies of horse breeders would take up the study of comparative anatomy of the several types of horses it seems likely we would learn something about horses which we do not know now. These trapezium bones may perhaps occur only in the mongrel horse and may rarely or never be found in specialized types of trotters, thoroughbreds or Arabs, but we do not know.

COLOR FACTORS IN THE HAIR OF THE HORSE

J. M. EGLOFF

Cedar Falls, Iowa

There has been much work done of late on the general question of inheritance of color in horses and many opinions have been advanced in regard to the basis of color. Many of these have been mere guesses instead of a careful study such as ought to characterize all scientific investigations.

With the object in view of learning if possible what really does determine or constitute color, the writer conducted the following investigation.

Thirty-three specimens of hair were collected from the various veterinary colleges located in different parts of the United States.

The colors were as follows: 6 black, 7 bay, 3 brown, 1 chestnut, 4 sorrel, 2 dun, 1 white, 2 gray, 2 mouse, 1 flea-bitten gray, 2 blue roan, 2 red roan.

Where only one of these is discussed, it will be understood that the specimens of this color are the same in essential, if not in absolute detail, as for example one might be a mouse color and another a dark mouse, etc.

As to the theoretical causes of variation, or the differences in coloration of horse hair, the theories advanced by investigators may be classed as follows:

(1) That the pigment granules are the same size but probably of varying numbers and certainly of three different colors, namely, yellow, brown and black, each representing a successively further oxidation of the same pigment base;

(2) The diversity in color is laid to a difference in number of pigment granules present;

(3) That the number of pigment granules is the same through all colors, but that the size varies, growing larger from sorrel to the black;

(4) That color may be affected by the density of the medullary layer; while it seems from my investigation that

(5) There is one other possible hypothesis, and that is that there is a differing arrangement of similar pigment granules which will produce the various colors according to the method of distribution.

DETAILED STUDY OF THE SPECIMENS

Series:—Sorrel, Dun, Chestnut, Bay, Brown, Black

Number 23, Sorrel.—The hair has a dark shaft. The pigment granules are scattered, being about equally spaced from each other and not clustered practically at all. The color effect under the low and high power is a light chocolate with perhaps a suggestion of orange or yellow, but this is due no doubt to dilution. Hairs of uniform sizes. The hide has the pigment granules massed giving it a somewhat deeper color.

Number 29, Dun.—The dun color seems to be really a roan, in that the hairs are not uniform in cross-sectional size (similar to the roans), the cortical layer chiefly varying. It has the white (unpigmented) hairs mixed in with the pigmented hairs. Those hairs which are pigmented seem to have the pigment granules gathered together to a slight extent. The color effect is a brown chocolate, but not

as light as was that of the sorrel. The individual pigment granules seem the same size as in the sorrel and the same color.

Number 14, Chestnut.—Here also we find quite a dark shaft in the hair.

The pigment granules are clustered quite closely and there is considerably more pigment present.

The pigment granules are the same size as before and of the same color. The color effect, however, under the low power of the microscope is a deeper brown due to the clustering of the pigment granules and the larger number present.

The skin in this slide seems to have the same kind of pigment present but the section is too thick for a detailed study.

Number 9, Bay.—The pigment granules are here found in quite regular clusters.

They are, however, individually, the same size as the former and of the same color.

The general color effect is about the same as Number 14, perhaps a trifle lighter.

There is also a scattering of pigment granules between the clusters all the way through the specimens so far studied.

Number 6, Dark Brown.—Here we find considerably larger clusters of the pigment granules with no pigment granules scattered between the clusters, as was observed in the specimens studied before.

The clusters are here not much larger (that is they do not contain many more pigment granules) but are much more numerous. The same pigment is seen in the epidermis but it does not seem to be there in the same amount, relatively speaking.

Number 19, Dark Brown.—About the same size of clusters found but they are very much more numerous than in Number 9.

The same color of individual pigment granules is still seen as well as the same size.

The color now passing through is a dark chocolate due to the thickness of the clusters. The skin has the same pigmentation but seemingly in relatively less numbers in comparison to the hair.

Number 8, Black.—There is here found not much increase in the size of the pigment granule clusters, but a marked increase in the number of the clusters.

The size and color of the individual pigment granules is the same. The same pigment is also present in the epidermis of the skin but not in as large proportions, evidently, as in the hair.[a]

[a] The clusters from the bay on, have not been markedly interspersed by the single granules.

Series:—White through Gray, and Mouse to Black

Number 7, White.—This specimen is not a true white. It has numerous white or unpigmented hairs along with hairs pigmented as are the black hairs except that the clusters are less frequent. (Many relatively large clusters of the chocolate pigment granules.)

The skin contains considerable of the chocolate pigment also. Hairs are of uniform size.

Number 11, Gray (Medium).—This specimen contains a mixture of the unpigmented and the pigmented hairs. The unpigmented hairs in this specimen being perhaps a trifle predominant.

The pigmented hairs are typical black hairs (pigmented with the many large clusters of the chocolate pigment).

Number 10, Mouse.—In this the percentage of pigmented hairs has been increased.

In these pigmented hairs the pigment clusters do not seem to be as large as the typical clusters found in the blacks or grays, and the general color seems to be a lighter chocolate due to more even distribution of the granules.

Number 4, Black.—Here we have again the many large clusters of the chocolate colored pigment.

Number 26, Red Roan.[b]—These are a rather un-uniform bunch of hairs in cross-sectional size. They are constituted of pigmented hairs with a mixture of possibly two-thirds unpigmented.

The pigmented hairs have practically the same characteristics of pigmentation as have the Bay (No. 9) and Brown (Nos. 6 or 19).

Number 26, Blue Roan.—This is found to be an un-uniform composite of black, brown and bay hairs with unpigmented white hairs.

The black, brown and bay show the same characteristics as above mentioned, in every respect.

The blue color of the blue roan is evidently derived from the black hairs present.[c]

Number 27, Flea-bitten Gray.—Bay hairs mixed with white (or white and a few black) in the proportion of about 8–60.

Here also the bay corresponds exactly to the bay above described.

[b] The roans: It seems probable from this study that grays and flea-bitten grays and also duns should be ranked as roans, the difference being mechanical, purely, in the distribution of the hair over the skin and also in the less frequency of pigment in the hair.

[c] It must be understood that black as commonly used is a misnomer, as it should be dark brown. Black, brown and bay have reference to external and not microscopic appearance.

CONCLUSIONS

From this study we see (1) that there is one color of pigment running through all colors of hair, (2) there is an increase in number of pigment granules from the lighter to the darker colors, (3) there is no apparent difference in size of pigment granules, (4) there is no apparent correlation between the size of the medullary layer and the color of the hair, with the exception perhaps of the grays, (5) and there is a very marked difference in the distribution of the pigment granules.

Through the sorrels there is an even distribution of the pigment granules, while through the dark brown and the black there is a very apparent clustering of the same. There is also an increase in the size and markedly in the frequency of the clusters toward the deeper colors.

From this we would deduce that seven factors may influence color, from the standpoint of inheritance. Namely: (*A*) Pigment factor, (*B*) Oxidizing factor, (*C*) Clustering factor, (*D*) Distribution factor, (*E*) Quantitative factor, (*F*) Pattern factor.

A. The pigment factor is pretty well understood in regard to its relation to inheritance. When present in connection with factor *B*, color is produced and in its absence typical albino forms result.

The writer obtained no specimen of a true albino.

B. The oxidizing factor is also recognized by most investigators. Its effect on the chromogen or pigment factor is uniformly that of color production. In the absence of *B* typical albinos also are formed.

C. The clustering factor is merely hypothetical, although the clusters themselves are apparent. When the clusters are large or frequent less light passes through the hair and a darker effect ensues.

D. The distribution factor is perhaps the normal condition. The pigment granules in the sorrels show a relatively even spacing throughout the cortical layer and the bays show the same condition between the larger clusters. The combination of these two factors may show why bay is epistatic to so many other colors.

E. The quantitative factor is relatively simple. Increased pigmentation produces darker color effects whether in the presence of factors *C* or *D*.

F. The pattern factors are various according to the patterns that exist in all horse species. The roan and gray pattern has the greatest influence on the general color effect, (these two are probably almost identical) the amount of white influencing mechanically. It is probable that the series in which this factor is present is dominant to the sorrel, chestnut, bay, brown and black series.

HALLETT'S METHOD OF BREEDING AND THE PURE LINE THEORY

J. Arthur Harris

Cold Spring Harbor, Long Island, New York

Before the symposium on the "Genotype or Pure Line Theory of Johannsen,"[a] Professor Webber urged the importance of certainty concerning the validity of scientific theories before they are unqualifiedly commended as rules of conduct for the practical man. Selection has been the key of the breeder's success. In his practical operations it is impossible for him to know whether he is selecting "fluctuations" or "mutations," "modifications" or "biotypes." Much harm may be done, Professor Webber insisted, by assuring the practical breeder (on the grounds of an inadequately supported theory) that he may give up continued selection for a mere process of isolation.

In this connection, it seems worth while to lay before breeders a few paragraphs from the noted cerealist Hallett. His experience while pertinent to, and extensively discussed in connection with, modern theories does not seem to me to have always been clearly set forth.

From his main paper,[b] we learn certain facts which indicate clearly his belief that selection within the pure line can effect an improvement.

After discussing, among other things, methods of planting to allow for full individual development[c] he continues:

> Yet the minutest characteristics of a plant of wheat will be reproduced in its descendants; so much so, that we can not only perpetuate the advantages presented to us in an individual ear, but by the accumulation of selection, make further advances in any desired direction. . . . . To me it has always appeared that, while offering an earnest of what a better system would effect, the mode in which the best varieties of our cereals have been raised (that is starting with *accidentally*[d] fine ears, and simply keeping the produce unmixed without any *further* selection) is a very imperfect one, and that its attainments are perhaps of less value than the earnest which it offers of future

[a] Held under the auspices of the American Society of Naturalists at Ithaca, December, 1910. For papers see *American Naturalist*, 1911.

[b] Hallett, F. P., "On 'Pedigree' in Wheat as a Means of Increasing the Crop," *Journ. Agr. Soc.* 22: 371–381, plate. 1861. In 1869, Hallet formulated seven laws concerning the improvement of cereals. These may be read in *Sect. Trans., Rep. Brit. Ass.* (Exeter) 39: 113, 1870, or in *Journ. Bot.* 7: 293, 1869.

[c] The possibility of an accumulative effect of the especially favorable conditions under which Hallett grew his pedigree plants must, of course, be taken into account. There is, however, little reason for attributing to this physiological factor a rôle at all commensurate with that of selection.

[d] The italics are as in the original.

success under a more complete system, for such beginning (and *ending*, so far as selection is concerned) with an accidentally fine ear, is a very different thing from starting annually with one of a known lineage.

Hallett's method of selection is as follows:

> A grain produces a "stool" consisting of many ears. I plant the grains from these ears in such a manner that each ear occupies a row by itself. . . . At harvest, after the most careful study and comparison of the stools from all these grains, I select the finest *one*, which I accept as proof that its parent grain was the best of all, under the peculiar circumstances of that season. This process is repeated annually, starting each year with the *proved* best grain, although the verification of this superiority is not obtained until the following harvest.
>
> During these investigations no single circumstance has struck me as more forcibly illustrating the necessity of repeated selection than the fact, that *of the grains in the same ear one is found greatly to excel all the others in vital power.*

Two things are clear from this quotation. First, Hallett used fifty years ago the "ear to row" test so often emphasized as a modern method. Second, his method of selection in wheat, a generally self-fertilized plant, was essentially a method of improvement by selection within the pure line!

Again, in another place,[e] Hallett leaves no doubt as to his position regarding selection.

> In the case of the potato, ... I have also applied my system, starting every year with a single tuber, the best of the year (proved to have been so by its having been found to produce the best plant), for now fourteen years. My main object has been absolute freedom from disease, and these potatoes are now descended from a line of single tubers, each the best plant of the year, and absolutely healthy; and concurrently with the endeavor to wipe out all hereditary tendency to disease, I have always kept in full view the point of increasing productiveness. The result may be thus shortly stated. Dividing the first twelve years into three periods, the average number of tubers upon the annual best plant selected was, for the first period of four years, 16; for the second period of four years, 19; for the last period of four years, 27, or nearly double the number produced during the first series of four years. And if, as I might very fairly have done, I had confined the first period to the first three years (instead of four), the last period would have shown an average of 27 tubers against 13 in the first period, or more than double. Here, exactly, as with the number of grains in the ear of the cereals, we reach in the last period of a long series of years, a standard altogether higher than in the first years of the series, and this no matter how we divided it into "periods." In the latter "periods" of a series of years the results vary according to season and circumstances; but (except in a case of disaster) in no year of the last year of a series *do they drop back to the standard of earlier years!*

[e] Hallett, F. P., "Food Plant Improvement," *Nature* **26**: 91–94. 1882.

In quoting this paragraph I am quite aware that geneticists are wont to be sceptical of the opinions of the men who have worked primarily for practical results. When there is not a mass of quantitative evidence, scepticism is quite justified. On the other hand, the opinion of a man who says he has actually done a thing on a large and practical scale is worth quite as serious consideration as that of the man who on limited experimental evidence says it cannot be done. But laying this question of the critical value of Hallett's opinions aside, one must admit that if a man's results are to be cited in evidence at all they should be correctly set forth. I believe some serious misunderstandings of Hallett's view have followed erroneous descriptions of his work. These can perhaps be best corrected by fair quotations from his own pen.

THE DOMINANCE OF RECESSIVES

A. JAY GARRISON

Edgewater, Colorado.

If dominance is an absolute principle and its relation to recessives is immutable, our subject is an absurd contradiction of terms, but these suppositions are in no respect true. Especially within the zone of variety, dominance is an extremely variable quantity. Genetic factors operate from radiating centers which may be readily shifted by the potency of either side in any given mating, or by a variety of environmental conditions.

Although we then knew nothing of the Mendelian terminology, our attention was first attracted to the principle of dominance in the autumn of 1867, while herding cattle in southern Iowa. In covering portions of four counties we encountered large native orchards of Americana plums. Our previous experience in nursery and horticultural work led us to examine these orchards with absorbing interest. We everywhere found three colors—red, yellow, and mottled or blends. While large groups of the same color were generally found in close proximity, occasionally a specimen of distinct color and variety had maintained its individuality. When examined at blooming time it was found that there was an interim of several days between the time of blooming of the individual tree and the adjacent group.

We have at times been greatly amused at the labored explanations of some scientists who portray nature as adorning herself in a gay attire of many colors and performing all manner of gyrations, *à la*

ballet dancer, in order to attract cross fertilization. Wild trees of the same species often stand in such close proximity that the twigs interlace and yet they never crossbreed by reason of the discrepancy in their time of blooming. For lack of better terms, we denominated the conditions we found in these wild plum orchards as supremacy of color and individual potency. On clay hills and places surrounded by forest trees, the red everywhere predominated, but along ravines where the soil was very rich the yellow came to the front with the largest trees and best fruits. As the tallest grass grew in these places, it was evident that the yellow varieties had been the greatest sufferer from the ravages of prairie fires. This led us to conclude that supremacy of color, or what we now call dominance, was an environmental question. At the return of each spring and autumn these investigations were renewed.

In 1893 we began to cross-breed Americana plums, also to hybridize with Japans, with a view of testing the principles of supremacy of color, individual potency, survival of the fittest, and natural selection by surrounding the seedling with uniformly favorable environment. Before the seedlings fruited the writer removed to Colorado, being very careful that they should accompany him. When the seedlings began to fruit it was evident that climatic environment had wrought a change on all the varieties. High altitude and consequent aridity, low temperature and almost continuous sunshine had decreased all vegetal factors, changed the color of the fruit, and stimulated early bearing, but had not decreased the size, quality or quantity of the fruit.

The variety that first fruited and has since borne the most frequently is a hybrid which displays the greatest amount of response to climatic change. It, with several others, ranks with the best commercial varieties. Its early and continuous bearing, by reason of late blooming and its ability to reproduce itself, easily enables it to hold the place of dominance in Colorado; but in Iowa we do not think it could do this, on account of its diminutive size of tree.

By reason of early blooming the Japan hybrids proved to be of no value on the eastern slope of the Continental Divide. This experience with plum seedlings and hybrids left us in the firm belief that heredity and environment are the *tout ensemble* of plant breeding.

Soon after removing to Colorado, we began to experiment with corn with a view of producing an acclimatized variety of sugar corn. A search for a suitable base was rewarded by finding a small semi-

dent variety which for a generation had matured at an altitude approaching 8,000 feet. With open breeding, this was crossed with White Cob Cory. The result was phenomenal. The length of ear over each parent was increased from 35 to 50 per cent. The acclimatized parent dominated all vegetal factors, the root system, the height of the stalk, distance of the first ear from the ground, etc. Several specimens showed a combined ear length of from 35 to 47 per cent of the entire length of the stalk. A 55-inch stalk produced a 23-inch ear length and a 50-inch stalk one 13-inch ear. This sugar corn has been crossbred with other varieties and bred back with the original base. The latter method appears to produce the better result. An unlimited number of mutations have appeared. One of these has dark red stalks and blades and the husk folds terminate in very prominent blades which are tipped with spinelike points. Another has a stalk about 3 feet in length and trailing suckers from 3 to 5 feet long terminating in fair sized ears. It goes without saying that the mutation making the greatest progress toward perfect acclimatization will assume the position of dominance. In one or the other parent this may have been a latent or recessive factor receiving great impetus from favorable crossbreeding.

This sugar corn has been planted from promiscuous seed and by the ear to row method. It has been tested under favorable and adverse conditions with all dry land farming forage crops recommended by the experts and has outclassed the entire list. Both by irrigation and dry land farming corn was grown by the prehistorics in Colorado, New Mexico, and Arizona, and its possibilities under all environment found in the United States are the greatest of any cereal in the world. Any desirable kind or color may be produced by an intelligent recognition of the demands of climatic environment.

At about the time that the scientific world came into possession of Mendelian terminology the Rhode Island Red breed of poultry appeared in the West and the writer began to experiment with this breed in an effort to test the principles of heredity and dominance. They were selected as a base because they gave evidence of having been crossbred for many generations.

We began no less a task than that of determining the heritable factors that had entered into the composition of these birds by continued crossbreeding. Hence this germinal analysis by crossbreeding was done in order to determine what we already had, rather than what we expected to get. Our, then new, conceptions of heredity still left us firmly believing that evolution certainly evolutes, but we had become

very suspicious that the cat did not always jump in the direction prescribed by the theoretical formula.

For five successive years the results from breeding this breed were fairly uniform. The Red Game male of the original cross made a creditable showing at controlling the color, form, and beauty of the males. The females were strikingly recessive in all respects except merit; in this, they appeared to be conservators of the merit of all crosses that entered into their composition. They also outnumbered the males from 5 to 20 per cent. The sixth year there was an incredible increase in the number of males, many of which were recessive in color. This result was readily traced to a male bird introduced into the flock that season to secure new blood. More than 90 per cent of his progeny were males, not one of which held the dominant color. Thus he not only reversed the dominance of color which had been fairly well established by five years' careful breeding, but from a commercial consideration he violently reversed the law of the survival of the fittest. In two years he would have assumed complete mastery over a flock of sixty-five females and ten males. For his audacity in wrecking our "best laid plains," the insurgent, with all his kith and kin, was speedily banished.

In crossing Barred Rock female with Red male the offspring were all blacks and all females; 50 per cent were pure blacks and the remainder blacks with slightly mottled breasts and necks. Seven of these pullets were mated with a pure black males, supposed to be a Wyandotte-Minorca cross. Two hundred and twenty-five chicks were hatched from this mating at six different hatchings. As was to be expected, these chicks were not as uniformly black from both black parents as the first generation were from a Rock × Red cross. In the second generation there was nothing visible that could be classified as dominance. The potency of the male was no more in evidence than the individuality of the females. The females were more uniform in color, form, and size than the males. It was a marvelous ensemble of heredity. In the first hatch there was one Barred Rock; in the second, one white; in the third, two whites; in the fourth, one pure buff and one white; in the fifth, four whites; in the sixth, all black or near blacks. Rose combs prevailed in the first two hatches, singles in the last two.

Many of the chicks made a showing at having the dominant color characters as they neared full development, but began to recede at the first annual moulting. We had fine black specimens of five different breeds. The whites were Wyandotte-Minorca blends with very

dark legs, and the buff was a diminutive Cochin. All that we expected to get in the second and third generations we got in the second.

Atavism was the most striking feature of this experiment. This is true of all second generation hybrids and crossbreds. It is also true that most, if not more, of the genetic phenomena usually classified as evolution is nothing but atavism. Mutations and so-called sports are the most immediate result of the infinite number of possible combinations of Mendelian pairs. In these combinations the pairs of an almost infinite number of preceding generations are to be taken into account. When the potency of two or more correlative factors is nearly or quite equal, dominance loses control, resulting in a compromising blend. More than 65 per cent of our second generation chicks were such blends.

To some extent, atavism may prevail in the most exclusive artificial fertilization. We place paper sacks upon the tassel and silk of the corn and mantle our trees to exclude foreign pollen. We pronounce our "mirabile dictus" on the evolutionary changes and hold our ear to the earth to hear the much coveted title, Wizard! This is to laugh, for what we got may have been an ordinary bit of heredity. From the same parents we are obtaining three apparently distinct breeds of chickens. While on the face of the returns they are new breeds, in reality we are only perpetuating the heredity of original crosses.

POSSIBILITIES FOR A NEW BREED OF CATTLE FOR THE SOUTH

DR. ROBERT K. NABOURS

Kansas State Agricultural College, Manhattan

Although nothing definite is known concerning the origin of Zebu, or Brahman, cattle (*Bos indicus*), Professor Lydekker[a] thinks that they originated in the Middle East (the Indo-Malay countries) where they are indigenous. The Zebu was domesticated probably 4000 B.C. or earlier, and spread from Asia to Africa, so that from ancient times the distribution has been much the same as now. Aristotle and Ossian knew of the Zebu in Syria, 27 B.C. It was described in Buffon's *Histoire Naturelle*, published from 1749–67, and the following fair description of them is taken from an abridged English edition of this work published in 1821:

[a] Lydekker: *The Ox and its Kindred.*

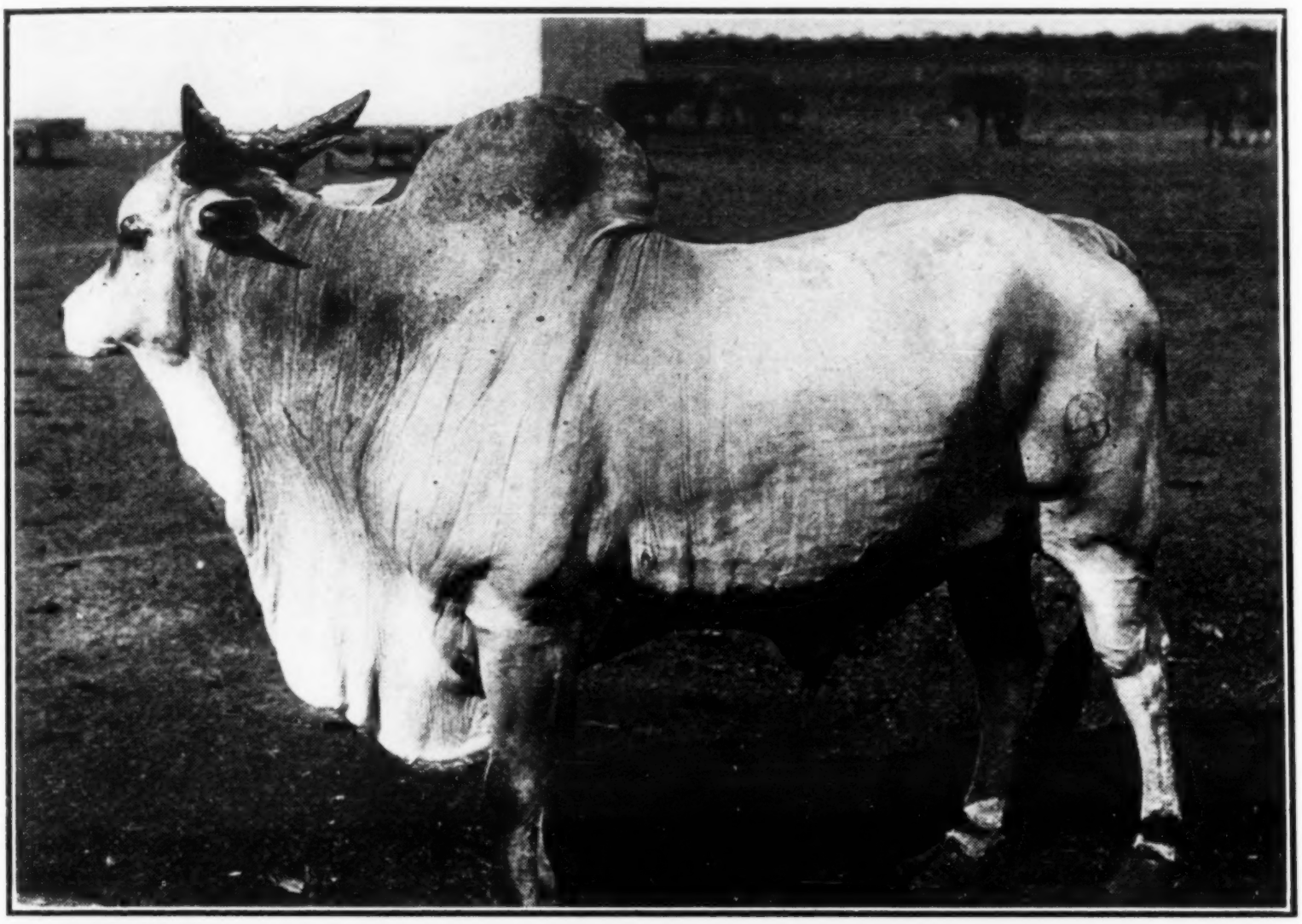


Fig. 1—Typical Brahman Bull.

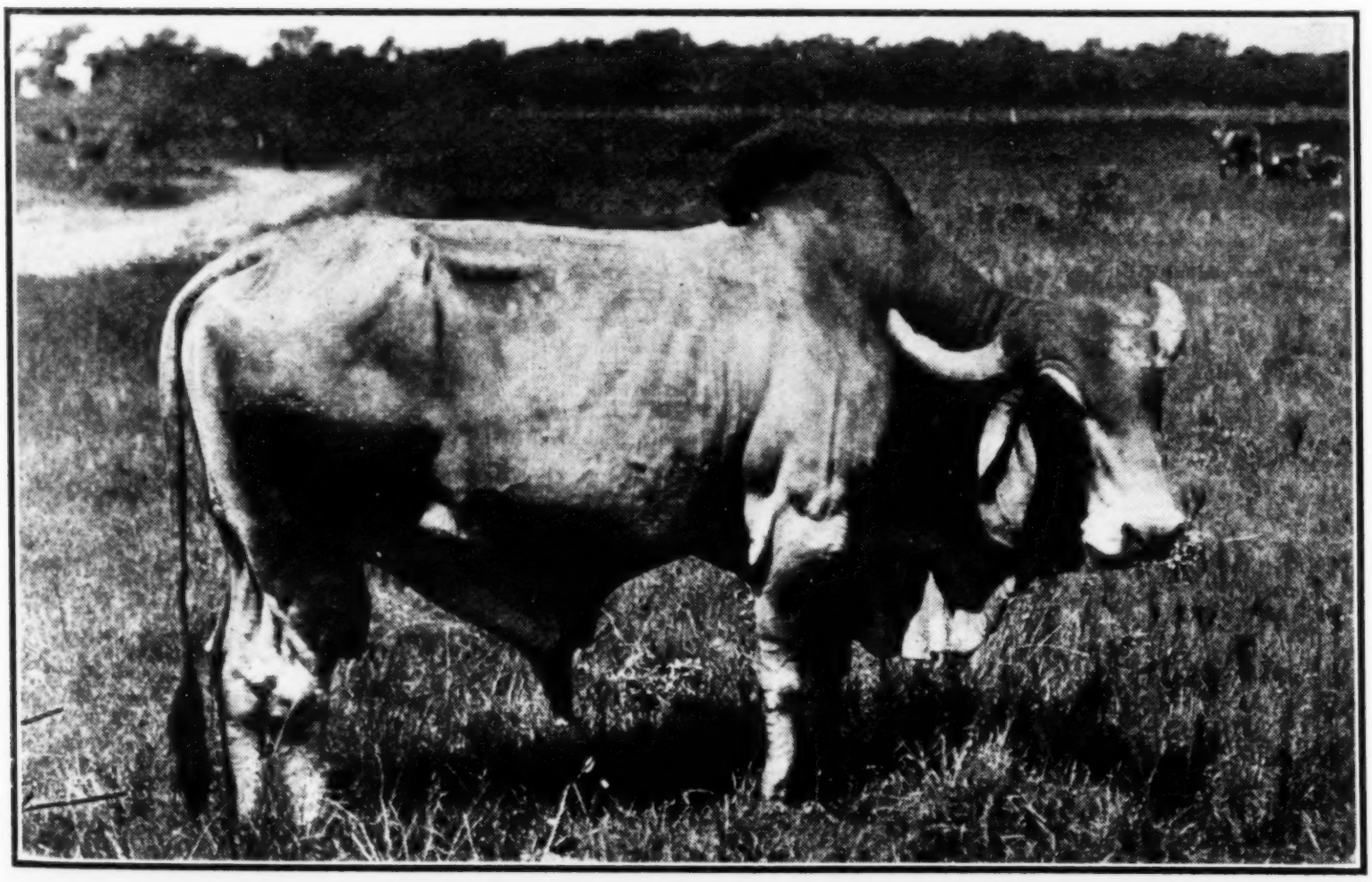


Fig. 2—Typical Brahman Bull.

In the whole continent of India the islands of the South Seas; in all Africa, from Mount Atlas to the Cape of Good Hope, we find nothing but hunched oxen; and it even appears that this breed, which has prevailed in all hot countries, has many advantages over the others. The hunched oxen . . . . have the hair much softer and more glossy than our oxen, who, like the Aurochs, are furnished with but little hair which is of a harsh nature. These hunched oxen are also swifter, and more proper to supply the place of the horse; at the same time they have a less brutal nature and are not so clumsy and stupid as our oxen; they are more tractable and sensible as to which way you would lead them.

In describing the hump the account further proceeds:

This hunch does not depend on the conformation of the spine nor on the bones of the shoulder; it is nothing but an excrescence, a kind of wen, a piece of tender flesh, as good to eat as the tongue of an ox. The wens of the oxen usually weigh forty to fifty pounds; some have them much smaller.

There are many breeds of Brahman cattle, and on the whole they appear to present a hybrid-complex analogous to that of *Bos taurus*. They appear in several colors, sometimes unevenly distributed over the body, creamy buff, brown, ashy gray, red, black, and white being the most prominent. In most of the breeds there is a large dewlap commencing close to the chin. The forehead is generally convex, the part above the eyes being quite short. The horns of the breeds from southern India are small but in other parts of India and all of Africa, they appear to carry large horns. Their sizes vary greatly, ranging from dimunitive breeds to those the largest individuals of which weigh upwards of 2000 pounds, and the males are larger than the females. The noise they make is more of a grunt than the low of *Bos taurus*. It appears that the hump, dewlap, sheath, horns, shape of head, color and the voice may be tentatively considered as well defined characters, but their genetic values have not as yet been determined.

They have been carried to nearly all parts of the world, especially to the tropical and subtropical countries. The strong draft oxen of Spain are the descendents of Brahman, crossed on Spanish cattle. They have been imported into Borneo, New Guinea, and many South Sea Islands, to Brazil, Jamaica, Mexico, and the southern United States. In fact, there is hardly a tropical or subtropical country into which they have not been introduced.

Reports from cattlemen from a number of the countries, to which they have been carried, indicate that they and their hybrid progeny are peculiarly well adapted to the tropics. They are said to be

FIG. 3—BRAHMAN COWS.

immune to all the destructive tropical cattle diseases. The Director of Agriculture of Jamaica writes that since the introduction of Brahman cattle the mortality of calves in the island has been reduced from 25 per cent to 6 per cent. Dr. J. Carlos Travassos, in the *Monographias Agriculas*, states that in northern Brazil, the imported Brahmans and their hybrid progeny are peculiarly fitted to resist the diseases and insect pests to which the European cattle easily succumb. According to this author, reported in a circular issued by Mr. Carl Hagenbeck, the same situation prevails in the several other tropical countries to which these cattle have been taken. A few hybrids have passed the winter on Colonel Goodnight's ranch in northern Texas and they resisted the severe winter weather of 1911–12 as well as, if not better than, the northern cattle. It is to be noted that the range of their distribution in India is all the way from the extreme tropics to the very cold regions of Thibet.

It seems that Zebus or Brahman cattle were first brought to the United States in 1849 by Mr. Davis of South Carolina. But their characters may have been long before that time introduced into the Southwest through Mexico from Spain, where it is known that the Zebu had been early introduced. It seemed that the Davis cattle were subsequently taken westward and their progeny distributed throughout the Southwest and Mexico. The thriftiness and resistance to ticks made these cattle favorites with stockmen, and it has been suggested by some cattlemen that the success in cattle raising on the range in southern Texas and other parts of the Southwest, during the middle and latter half of the last century, was due largely to the early introduction of these Davis and other cattle carrying Brahman characters. It has been further suggested that the elimination of these resistent characters through the later introduction of the Hereford, Durham, and other non-resistent beef cattle from the north accounts for the present difficulty in raising cattle on the tick and insect infested ranges and pastures.

The great hindrances which the ravages of the cattle tick and its attendent evils place in the way of beef raising in the South and Southwest, is being charged up in these days as some of the factors of the beef famine. The editor of the *Scientific American* (October 12, 1912) states that in North Carolina there are six persons to each head of cattle of the value of $12.60; in Georgia there are four persons to each head valued at $11, and in Mississippi three persons to one head valued at $10. In a recent Department of Agriculture publication, (*Farmers' Bulletin* 498) Dr. H. W. Graybill says:

The eradication of the cattle tick (*Margaropus annulatus*) from the southern states is a problem of prime importance to the agricultural interests of that section. The elimination of the tick would give a tremendous impetus to the cattle and dairy interests of the South, place southern agriculture on a more scientific and profitable basis, and, as a consequence, give a greater measure of prosperity to the South as a whole. Although the extermination of the tick would be of the greatest benefit to those states in which the tick now occurs, the benefits resulting therefrom would not be confined to them, but would be enjoyed to a greater or less extent by the rest of the country, in consequence of which the problem becomes, to a certain degree, one of national importance.

In the portion of this bulletin entitled "Reasons for Eradicating the Cattle Tick" the author pictures a perfectly true situation in regard to the direct damage caused by the tick and the induced evils so astonishingly bad that it is not surprising in the least that the numbers of cattle in the various states are so exceedingly small. Some of the points developed are as follows: the tick in drawing blood from the cattle emaciates them, thus making it quite impossible for the young cattle to reach their full size or to become fat, however well they may be nourished. The tick is the carrier of organisms which causes splenetic fever (Texas fever), a disease which causes the loss, unless they be immunized at great expense, of 90 per cent of the cattle brought in from outside the tick area. This situation has caused the government to maintain a quarantine line which extends from the coastline of southern Virginia across the country to the southwest boundary of Texas. This necessary quarantine makes the shipment of cattle northward across this line almost prohibitive, while, as already stated, the shipment of cattle southward without the costly immunizing process, cannot be considered. On this account, breeders in the South cannot exhibit their cattle in the North, and the exhibition of northern cattle in the South is seriously interfered with. The total loss annually from the ravages of the tick has been estimated at $40,000,000 to $100,000,000.

The seriousness of the situation was realized by stockmen as early as the 70's and 80's. About the year 1880, Mr. A. H. Pierce, of Pierce Junction, in southern Texas, conceived the idea of introducing more Brahman cattle. Concerning this introduction and the physiological and anatomical reason, for the immunity of these cattle and their hybrids, to the bite of the tick, Dr. John R. Mohler says:

These animals were crossed with our domestic cattle and the resulting influence on the herds was markedly apparent. One of the most interesting observations was that their progeny remained relatively free from ticks, while

other stock in the same pasture would be literally covered with the pests. The cattle ticks are present in such enormous quantities in this section of Texas as to make cattle raising much less profitable than it should be. This is due not so much to the fact that these ticks carry the Texas fever micro-organisms as to their great blood-sucking powers as external parasites. The Brahman grade cattle appear likewise to be less affected by other parasites and pestiferous insects, such as mosquitos, horn-flies, gad-flies, etc., and to withstand better the warm dry climate and other semitropical conditions present in the Gulf coast sections than do the native cattle. . . . .

The sebum secreted, by the sebaceous glands of the skin has a peculiar odor which seems to be repugnant to insect life. The hide, while it may be as thin as in our domestic animals, still appears to be much tougher and is much more difficult to penetrate with a hypodermic needle. The hair is quite short and does not provide favorable shelter for the development of the ticks. These three factors are probably responsible for the slight amount of tick molestation which these animals experience.[b]

In 1906 Mr. A. P. Borden, imported another herd of about 30 head of Brahman cattle, mostly young bulls, and he crossed these extensively on native Texas cattle and purebred Herefords, and Durhams and grades of these. Mr. Borden's experiences in importing these cattle are interestingly related in his paper "Indian Cattle in the United States."[c]

In September, 1911, I was kindly permitted to visit the herds at Pierce for the purpose of studying them and making photographs. The preliminary observations made on this visit were published in the *American Naturalist*, vol. xlvi, no. 547. It was observed then that whenever Brahman cattle are crossed on pure or grade Herefords the color and other characters of the latter are, on the whole, dominant in the F_1 generation, and when the cross is on grade or pure Durham the characters of these are dominant in the F_1 progeny. However, a slight hump, a considerable dewlap and sheath similar to that of the Brahman, appear in all the F_1 progeny observed, so that the result is not far from a blending of characters. This observation is not in accord with Professor Lydekker's statement *The Ox and Its Kindred*, p. 248) that "The steers, at any rate of the hybrids hitherto produced, are strikingly like the male parents (Brahman) having well developed humps, large pendent ears, and showing more or less white in the neighborhood of the fetlock." The above statement appears to be based on the work of Mr. Carl Hagenbeck in breeding hybrids, but from the descriptions and photographs of his hybrids, contained in a circular sent me by Mr. Hagenbeck, it is not easy to

[b] Twenty Sixth Annual Report of Bureau of Animal Industry, Department of Agr., 1909, p. 84.
[c] *The American Breeders Magazine*, vol. I, no. 3.

see how Professor Lydekker could have arrived at his conclusion. Also in British East Africa, where experiments are being carried on in crossing Herefords and Shorthorns on the native cattle, of Brahman blood, it appears that the characters of the European cattle are dominant in the F_1 progeny.[d]

It was observed also that when the Brahmans were crossed with native "Texas cattle" the resulting F_1 progeny, in some cases at least, resembled the Brahman parents mostly, but this is probably due to the fact that the native cattle already have Brahman characters in them, their desirable qualities having favored their perpetuation since the early introduction.

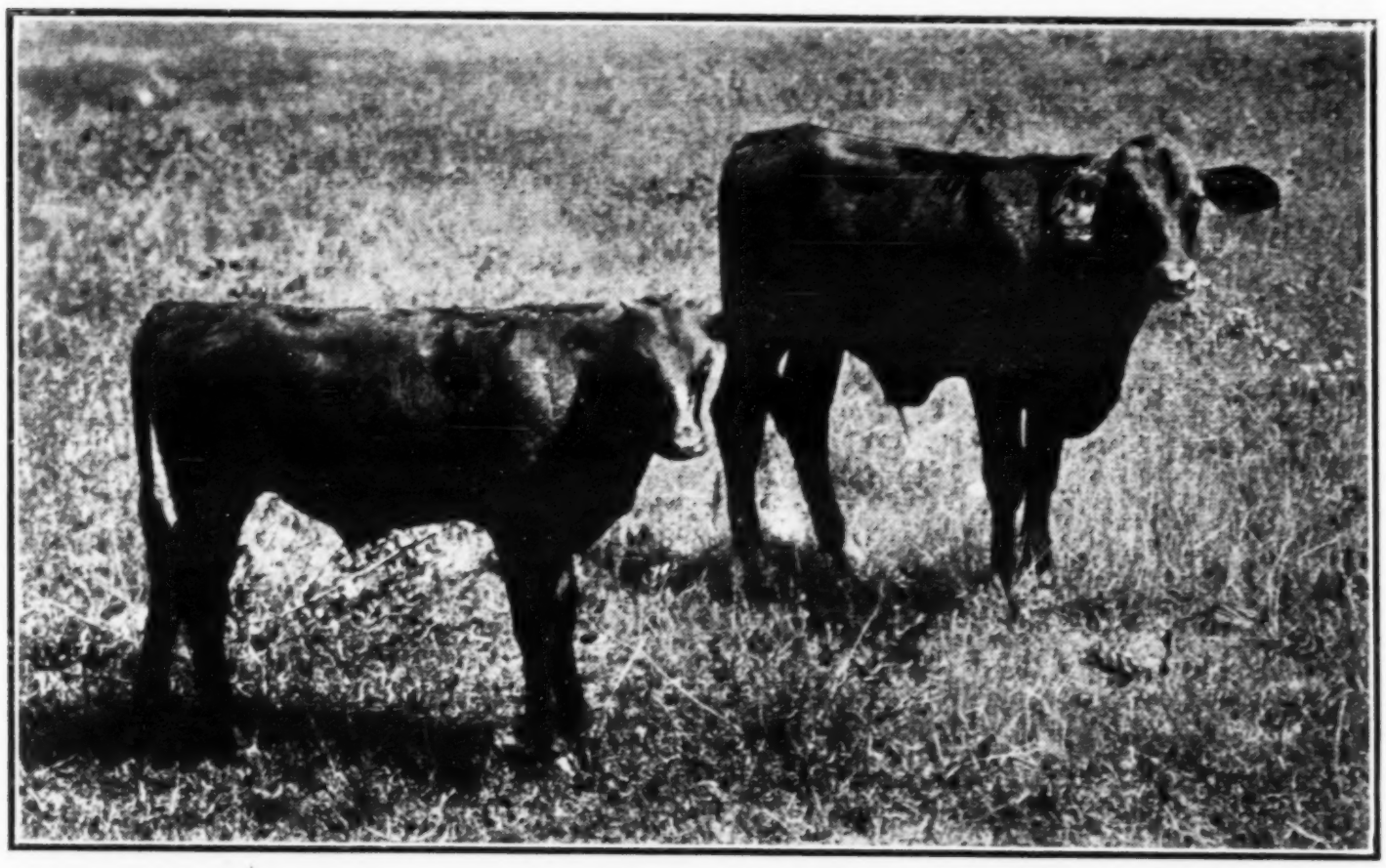


FIG. 4—CALVES FROM F_1 BRAHMAN-GRADE DURHAM COWS.

Bred back to Durham, show nearly pure, if not pure; Durham on left and typical hybrid on right.

It was further observed in the F_2 generation that there was apparently complete segregation and that the ratios appeared to approximate fairly closely the Mendelian expectations. However, it has been pointed out to me since that some of the grade cattle of the original crosses probably carried Brahman characters, a matter which was given cognizance (*loc. cit.*). Although this fact does not preclude the idea of Mendelian segregation, yet it might indicate other than a simple 1:2:1 ratio. As a matter of fact, observations made this summer and to be described later, indicate that the segregation is not so simple as it at first appeared to be.

[d] *Outdoor World*, and *Recreation* November, 1912.

In the paper cited it was noted that the claims made concerning the immunity to ticks of the Brahman and their hybrid offspring were well founded. Also that the hybrids average much larger (as much as 50 per cent) than the native or Hereford or Durham cattle kept under similar conditions, and that they are far more prolific. A male will impregnate 75 or 80 cows each season as against 25 or 30 impregnations by the Hereford or Durham.

In August of 1912 I was permitted to visit the Borden herds again. The time was limited and the information that could be given me was

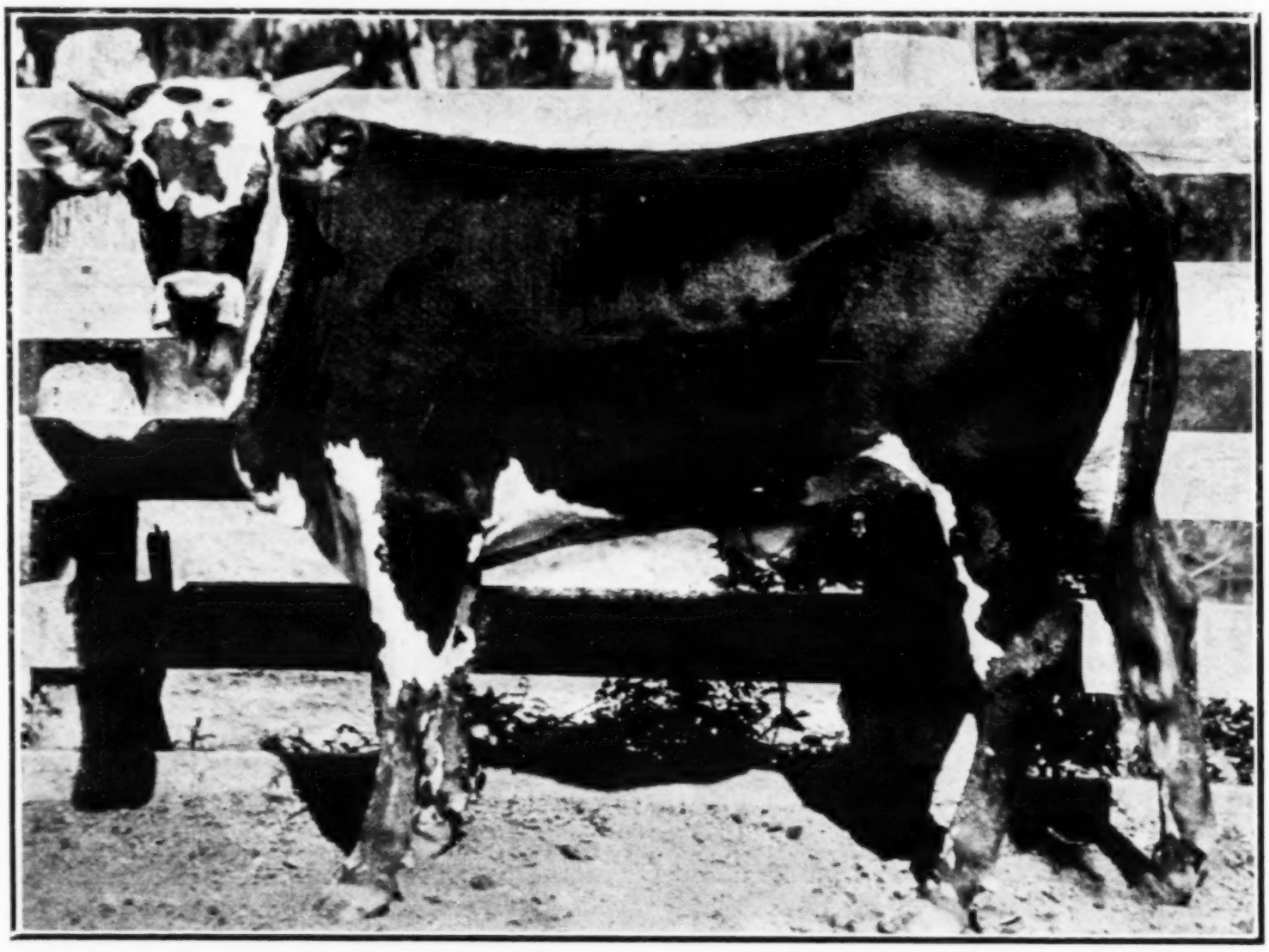


FIG. 5—BRAHMAN-HEREFORD F_1 HYBRID.

This Heifer weighed 1000 pounds at twelve months of age. She was tick-free on a tick-infested pasture.

extremely meager, so that the records made were even less adequate and less satisfactory than those made last year. Under the conditions of the experiment this situation is likely to become less satisfactory each succeeding year. It was not possible to study the calves and yearlings (now yearlings and adults) observed in 1911, because it had been necessary to separate them, many of them having been sold and the others mixed in such ways that nothing could be determined concerning their ancestors. One bunch of F_2 males from the different herds observed last year (*loc. cit.*) ranged in appearance all the way from an apparently perfectly pure Durham (*loc. cit.*, fig.

5, left) to nearly pure Brahman. However, a perfect Brahman was not seen. There were some with the full complement of hump, dewlap, sheath, ears and perhaps some other characters, but in each case some one or more characters was lacking.

In one herd of forty-five to fifty Brahman-grade Durham hybrid cows that had been bred back to pure Durham, three, possibly four, of the calves appeared to present the characters of the typical Brahman-Durham hybrids, while two or three appeared to be pure Durham (fig. 4). The others, about forty calves, varied between these two types, most of them ranking as apparently midway, or three-fourths Durham. Thus it appears that there may be a kind of blending such as Castle found in size and bulk characters of rabbits, or as later suggested by the same author, "Unit character segregations may really occur, though their presence is obscured because dominance does not occur."

FIG. 6—BRAHMAN HYBRID COWS AND CALVES.

The cows are F_1 hybrids from Brahman on high grade Hereford, and the F_2 calves are from these hybrid cows bred back to Brahman.

In another herd of Brahman-high grade Hereford hybrid cows bred back to Brahman, some of the calves were strictly of the hybrid type while some were mostly of the Brahman type, except for one or more characters, either the color or complete hump, droop of the ears, shape of the head, or something else. No perfect Brahman was observed among thirty-five or forty calves (Fig. 6). However, it may be noted that there are only a few, if any, that can be considered anywhere near three-fourths Brahman and one-fourth Hereford—they range from midtypes (hybrids) to pure Brahmans, except for a character or more.

FIG. 7—BRAHMAN-HEREFORD HYBRIDS.

The cows are Brahman-high grade Hereford F_1 hybrids and the F_2 calves are from these cows bred to a Brahman-Hereford F_1 hybrid bull.

In another herd of F_1 Brahman-high grade Hereford hybrids which had been mated to a Brahman-Hereford F_1 hybrid male, F_2 calves were found of many types from nearly pure Herefords (always lacking a character or more or having, in part at least, one or more Brahman characters) to a nearly pure Brahman (lacking one or more Brahman characters or having one or more Hereford characters) (figs. 7 and 8). There were about 50 calves in this herd. It was not possible, under the circumstances of the study, to place the different types into groups and to ascertain the ratios. An effort to do this from horseback failed, yet I am confident it could be done.

The only F_2 specimen of last year's study to be observed particularly was the apparently pure extracted Durham now a year and a half old (*loc. cit.*, fig. 5, left). He is quite small and still shows no trace of any Brahman character. The purpose in examining him closely this time was to see whether he is immune to the ticks. But it was found that the ticks had been apparently completely eliminated from the pasture on which he was grazing, so no test of this kind could be made. So far as I could ascertain in the short time that could be given to an examination of the grounds and cattle, it seems that there are no ticks now on the pastures which have been used exclusively for Brahman and grade Brahman cattle for a year or more. It is desirable, however, that a further examination be made by some person trained in the work of detecting ticks before it can be safely said that no ticks at all remain.[e]

Summary and conclusions.—The origin of the various breeds of Brahman cattles (*Bos indicus*) is as obscure as that of the breeds of *Bos taurus*, though the best opinion seems to point to an Indo-Malayan origin for the species as a whole.

Brahman cattle have been introduced to many, if not all, tropical and subtropical countries. Reports from the stockmen of these countries are invariably favorable. The Brahman cattle and their hybrids appear to resist the cattle diseases endemic to the tropics. They are either not bitten by ticks and insects pests, or are not injured by them.

They are not strictly confined to warm countries, but appear to do well in such cold climates as northern Texas and in the high cold altitudes of Thibet.

[e] Mr. J. H. Hutchins has lately investigated this matter for me. The pastures have not been used at all times exclusively for Brahman and hybrid cattle and are not entirely free from tick infestation.

FIG. 8—BRAHMAN HYBRID CALVES.

From the same herd as figure 7. These calves are good examples of segregation in the F_2 generation.

It is not known when Brahman characters were introduced into the United States, but mostly, probably, they first came in with the Spanish cattle early introduced through Mexico from Spain.

The success in raising cattle in the Southwest during the latter part of the last century was in large part due to the tick and insect resistant character or characters of these early introduced Spanish cattle and later to the Davis, Brahman, and Brahman grade cattle.

It is suggested that the decline in cattle raising in this region is in some part due to the more recent introduction of the non-resistant beef cattle of the northern states, which has largely eliminated the resistant characters which make up, in part, the native "Texas cattle."

It appears that the first hybrids from the crossing of Brahman bulls on pure or high grade Hereford or Durham cows give F_1, offspring that average, under the same living conditions, 50 per cent or more larger than the Herefords, Durhams, or native cattle, and they are better "rustlers."

The Brahman bulls are far more prolific than Hereford, Durham, or native cattle.

In Texas and Germany it appears that the characters of the Hereford or Durham are, on the whole, dominant in the F_1 generation in the crossings where the Brahman males are used. In British East Africa it appears that the characters of the Hereford and Shorthorn are dominant in the F_1 generation in the reciprocal crosses where the Hereford and Shorthorn males are used.

There is perfect segregation in the F_2 generation, but the conditions of the experiment, especially the lack of records, and facilities for study are such that the number and kinds of factors cannot be ascertained. It appears, however, that the peculiar horns, dewlap, and sheath, drooping ears, large hump and color may be unit characters.

It may be that some of the size and bulk characters blend permanently or that a hybrid complex might be created that would breed very closely true to some new type which would combine the tick, insect, and tropical disease resistant character of *Bos indicus* with some of the desirable beef or milk characters of *Bos taurus*. The use of first hybrids, at least, from *Bos indicus* on *Bos taurus*, might greatly facilitate the work of eradicating the Texas cattle tick and the splenetic fever transmitted by it from the pastures and ranges in the southern states, and thus prevent the loss of many millions in money each year. Enough is now known concerning this matter to warrant

preliminary tests being started at once.[f] In the event preliminary tests should confirm conclusively the idea that the pasturing of hybrids on land will thoroughly eradicate the tick from it, farmers and stockmen would no longer resist the efforts at eradication but would join in heartily with the work.

Whatever agency may concern itself with the handling of this work, very careful genetic records should be kept; and the larger the project, the greater the opportunity for studies in cattle genetics. It has been a great loss to science that a genetic record of the Borden herds has not been kept.

I desire to express my deep appreciation of the courtesy shown me by Mr. Borden and Mr. Pierce Withers, and my thanks to Prof. T. J. Headlee and Director Ed. H. Webster, who were instrumental in making possible the trips for the studies.

"If Eugenics is to enter the national life of the American People, not only the ministry, but the educators, the editors, the public lecturers, the doctors, the political leaders, and the social workers, and, in short, all classes and professions that play a part in leading public opinion must get right on Eugenics. I feel that the first thing they must understand is that at root Eugenics is a biological problem, and that its truths cannot be arrived at by arbitration and discussion. It concerns primarily the natural inheritance of human traits, and truth can be found out only by first hand observation and analysis."—H. H. LAUGHLIN.

"Man may select and preserve each successive variation, with the distinct intention of improving and altering a breed, in accordance with a preconceived idea; and by thus adding up variations, often so slight as to be imperceptible to the uneducated eye, he has effected wonderful changes and improvements. . . . . As the will of man thus comes into play, we can understand how it is that domesticated breeds show adaptation to his wants and pleasures. We can further understand how it is that domestic races of animals and cultivated races of plants often exhibit an abnormal character, as compared with the natural species, for they have been modified not for their own benefit, but for that of man."—CHARLES DARWIN.

[f] It is not desirable that general and promiscuous experimentation be inaugurated. The experiments should be supervised by trained men in connection with some responsible institution.

PRESIDENTIAL ADDRESS: NINTH ANNUAL MEETING[a]

HON. JAMES WILSON

Secretary of Agriculture, Washington, D. C.

Considering the preliminary meeting held at St. Louis nearly ten years ago, as the birth of the American Breeders Association, the ninth annual meeting marks the first decade of its life. You have honored me with the presidency during this period. I want to thank you for this honor and to express regret that I have not been able to meet with you more frequently. I wish also to review, briefly and appreciatively, the history and the work of this organization.

Your secretary, Mr. Hays, upon his return from the first Hybridizer's or Genetics, Congress in London in 1899, brought to my attention the need of the American Breeders Association and requested that I suggest a method of procedure that might bring about such an organization. His recollection is that I recommended the formation of a committee for that purpose by the Association of American Agricultural Colleges and Experiment Stations. Such a committee was formed in 1901, with Mr. Hays as its chairman. The other members of the Committee were Director L. H. Bailey of Cornell, Prof. T. F. Hunt of Cornell, Dean C. F. Curtiss of Ames, Iowa, and Dr. H. J. Webber of the United States Department of Agriculture.

Some delay was occasioned in the calling of the first meeting by the intervening international meeting of hybridizers, under the auspices of the New York Horticultural Society. The first meeting which was really of such character that it might be considered an annual meeting was held in the city of St. Louis in December, 1903. This meeting was well attended and a goodly number of splendid papers were presented. The next annual meeting was at Champaign, Ill., early in 1905. The proceedings of the preliminary meeting and of the Champaign meeting were published as the first Annual Report of the Association. Following this first annual meeting successive annual meetings were held at the following places: Lincoln, Nebr.; Columbus, Ohio; Washington, D. C.; Columbia, Mo.; Omaha, Nebr.; Columbus, Ohio; and Washington, D. C.

The published work of this Association has been permanently recorded in eight bound Annual Reports, three volumes of the *American Breeders Magazine*, and various bulletins of the Eugenics Section of the Association. These reports and magazines and bulletins

[a] Address of the Retiring President of the American Breeders Association, January 27, 1913, at Columbia, South Carolina.

undoubtedly contain the best body of knowledge published under any auspices relating to the technical study of genetics, eugenics, and plant and animal breeding. The work of Mr. Hays, Dr. Davenport, Dr. Webber, Professor Spillman, and others who have persevered in building up this Association has been a work of love for the cause, but it will pay in dividends to the country and to the world.

Those of us who have not been able to attend the meetings regularly and have often thought that the Annual Reports and even the quarterly *Magazine* have been rather abstract in nature have not fully realized the significance of this organization's work. One year ago I had the pleasure of making a brief address at your meeting and of listening to one of your able members, Dr. H. H. Goddard. His address, so clearly showing the hereditary nature of feeblemindedness and so clearly suggesting the possibility of eliminating this strain of weakness from the heredity of the human family, thoroughly aroused me to the importance of the work you are accomplishing.

This Association has clearly blocked out for itself a new field. It has already done much to give direction to research work relating to heredity and to breeding. Through its conferences, public addresses, and publications it has done much to give direction, interest and impulse to the work of introducing new plants and animals; creating new varieties, families, and breeds; and encouraging the wider distribution and use of the more efficient strains of plants and animals.

This organization has rendered material assistance in developing the men who, in the United States Department of Agriculture, in the State experiment stations, and under other public and private auspices, are leading in the development of the science of breeding and in the creation of improved forms of pedigreed plants and animals. It has stimulated the organization of clubs devoted to genetics and eugenics in our centers of learning and in our large cities. It has given ideas to universities and colleges, leading them to the establishment of lectureships and chairs of genetics and eugenics.

Its publications have begun, finally, to influence widely the discussion of breeding in that section of the agricultural press which deals with the improvement of our domestic plants and our domestic animals. And the day is rapidly approaching when our live stock papers will more and more follow the lead of the publication of this organization as to the facts and philosophy of breeding.

You have done much to make the names of such men as Mendel, DeVries, and Burbank widely known throughout the entire country. You have given inspiration to many who in public or private station

are taking up the study and the practice of scientific breeding of plants and animals. You have developed and put forward broad policies for the organization of plant breeding and animal breeding, and latterly you have so developed the subject of eugenics that the entire country is aroused as to the vital importance of the science of human heredity and the application of this science to the improvement of the human family.

You have not only brought together in one unified organization and movement the breeders of plants, the breeders of animals, and those interested in eugenics, but you have also brought together the scientist and the practical breeder; and in addition you have, in your membership, brought together many of the leading genetic scientists of the world.

You have developed in your eugenics section a great experiment station and institution of research, with a splendid building called the Eugenics Record Office, containing fire-proof vaults. Your eugenics laboratory extends out from this record office and embraces the lives of the people. Your laboratory material is the heredity that runs through the veins of the good, bad, and indifferent families of our great country. Your one or two dozen scientific eugenists who are devoting their time to assembling the genetic data of thousands of families in these fire-proof vaults are making records of the very souls of our people, of the very life essence of our racial blood. As these genetic genealogies are recorded, new values will be given to families. Those families which have in them degenerate blood will have new reason for more slowly increasing their kind. Those families in whose veins runs the blood of royal efficiency will have added reason for that pride which will induce them to multiply their kind.

The foundation which this Association now has already created upon which to build its future work is broad and substantial, and the field of opportunity is large. Up to this time there have been many advantages in having in this Association a relatively compact organization of specialists. Without the disadvantage of an unwiedly membership clamoring for more popular publications, you have been able to lay down the fundamental lines of work which a general organization of this kind can do. You have not sought to encroach upon the lines already undertaken by such public institutions as departments of agriculture and experiment stations. You have rather confined your efforts to supplementing these agencies along those lines which their interests do not cause them to wholly cover.

But the time has come when you are approaching a new situation, in part the result of your own work. The public is becoming

aroused as to the importance of more science in the breeding of plants, animals, and men. These important subjects are getting into the courses of study of our colleges and universities. Associations of different kinds are beginning to discuss genetics, and especially those lines relating to human heredity. The demand is arising that the people be taught these new facts as rapidly as they are developing. The accumulation of genetics family records by the Eugenics Record Office and the facts and philosophy growing out of this work are creating a demand that the results be made available to the public. Young people who fear that common weakness on both sides of the proposed family may result in inefficient children or in unfortunate tendencies are beginning to knock at your doors for this knowledge. The colleges and universities of the country are coming to see that they need your help in bringing into our school system sane instruction relating to heredity and eugenics. The press is frankly open to the statements which your leaders may care to write. Book publishers have already shown their confidence in the popularity of eugenics, as well as in the newer philosophy of plant breeding and animal breeding, by beginning the publication of books written by your members. The public is showing a great interest in the lectures which deal with the subject of eugenics.

Even people of means are beginning to look to your organization as an avenue through which they may serve the world by placing endowments in the hands of your scientists, to put forward the science of genetics and place eugenics as well as plant and animal breeding on a scientific basis.

A new line of public service has recently developed which promises more far-reaching results than those relating to improvements through breeding: The work of our agricultural research institutions has demonstrated that we can slowly but surely and very economically increase production by finding those best families, strains, varieties, breeds, and sub-breeds which yield the largest net profits per acre or per farm, and multiply them so that they will supplant all inferior forms. To so educate, place in position of advantage, and reward the best part of the human race that they will rapidly multiply and become the great improved body of people which can best utilize the opportunities of this beautiful earth at first seems like an Utopian vision. Like world peace, however, it may come; and may we not all ask; Why should it not come? Must science stop in its beneficence with the plant and the animal? Is not man, after all, the architect of his own racial destiny? Cannot the best people of the best races be wise enough to multiply and become dominant in numbers as well as in efficiency and goodness?

May I not appropriately commend in the highest terms the sanity and care with which you have developed this organization? The placing of the group of trained genetic scientists in the leadership in the new and delicate field of eugenics has proven to be a matter of national importance. This subject, has on this account doubtless escaped a period of pseudo-science and has plunged at once into a discussion of vital problems.

The organization of the Eugenics Section is alone of sufficient value to repay for all the time, energy, and money expended on this organization.

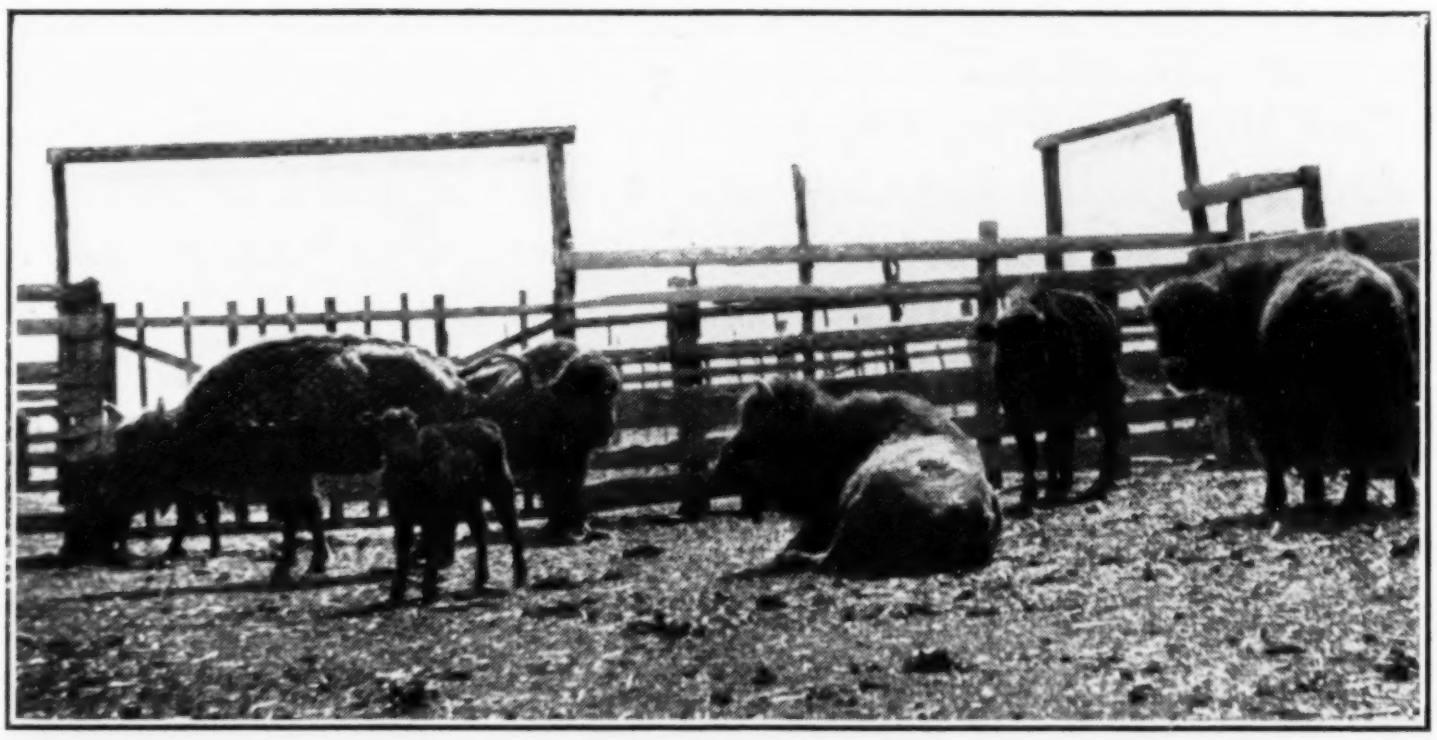
People who wish to use surplus means in the endowment of public work will make no mistake by placing goodly sums at the disposal of the American Breeders Association. I observe that you are publicly asking for a foundation of half a million dollars. Twenty times that sum, or ten millions, would come nearer the mark. The subject of eugenics alone, which can be better developed under a public welfare association such as this than under governmental auspices, needs large endowment. Besides, there are many lines of research and initiative in the creative breeding of plants and animals which in the natural course of affairs will lie in the twilight zone between the activities of public agencies and those of private and commercial agencies. There will be no end of practical projects which will present themselves. Furthermore, this organization has open to it a very large field in purely scientific research along genetic lines.

The largest immediate need of the Association doubtless is means with which to develop its service in relation to public education, to popularizing the facts already known or assumed to be known. You need officers to build up your publications. The *American Breeders Magazine* is especially worthy of support. As a monthly it would have a field as large as that of the *National Geographic Magazine*, which now goes out to one hundred and sixty-five thousand members. Every breeder and grower of pedigreed plants and animals, as well as every person interested in eugenics will find membership in this Association useful and the Association most pleasant. You need other officers to coöperate with universities and other institutions of learning, with the church, and with other organizations which are in position to lead the people aright in matters relating to eugenics.

You have laid the foundation for a great public service organization. I am proud to have been your president. I thank you for the honors and courtesies, and I shall watch with great interest your further development.

Buffalo Herd, 130 in Number, on Ranch at Goodnight, Texas.

Three of Colonel Goodnight's Cowboys.



Buffaloes on Goodnight Ranch Being Specially Fed as They had Lost in Flesh during the Severe Winter Weather.

EDITORIALS

THE NOVICE NEEDS PROTECTION

When the farmer or the city man decides to engage in the breeding of pedigreed live stock, he too often becomes the victim of unscrupulous dealers and traders who lie in wait seeking whom they may fleece. These are the men who are most likely to know of his decision and the most ready to volunteer their services and advice. The inexperienced, being largely ignorant of blood lines and values, is an easy prey.

It is only a question of time when the victimized breeder realizes his mistake, and in a majority of instances this experience, coupled with lack of experience in proper methods of care and management, disheartens and disgusts to such an extent that he abandons the business for good and for all.

The legitimate breeder has not profited, certainly not the loser. Justice is seldom meted out to the unscrupulous until his victims are numbered by the score or by the hundred. There is no way to protect the novice except as he confides in and advises and deals with reliable breeders. The army of reliable breeders is large but needs recruiting. Pedigreed record associations, backed by a majority of reputable breeders, should more courageously exclude from membership in their association any one earning an unsavory reputation. They should guard their own transactions with such uprightness and regard for straightforward and clean-cut honesty that they can fearlessly assist such work. Then and not till then will the novice be reasonably secure.—HERBERT W. MUMFORD.

THE MARRIAGE LICENSE CLERK

The Very Reverend Dr. Summers of Chicago has effectively started the discussion of the desirability of requiring medical examination of persons who contemplate marriage, that the state and the church may avoid joining in wedlock those who cannot bear normal children. Since the theme has been accepted as one open to general discussion it would seem but natural that its scope be broadened so as to include the larger and even more vital aspects of the subject. There is no reason for delay in meeting this matter in that frank way in which all vital subjects must in the end be met. There is need that the genetic qualities of the parties desiring to join in wedlock

be made the subject of inquiry, and that the genetic values of all people be as an open book to all other people, that some consideration can be given to definite information as to the value of the heredity of each and every person eligible to marriage.

As Prof. R. DeC. Ward of Harvard so clearly showed in his address before the last meeting of the American Breeders Association, we must keep the brothers and sisters of feeble-minded people, as well as those who show feeble-mindedness in their own make-up, from immigrating into our country. The normal brother or sister of a feeble-minded person carries in part of his or her germ plasm the same heredity carrier as do the brothers and sisters in which this character is dominant. And people whose families show that part of their children will be feeble-minded, insane, criminal, or immoral, or in any other way defective, have not the full claim to the rights to produce citizens as have others, none of whose progeny will be a burden upon society.

But withal, this movement must creep before it can walk. The minor things which may be done now are the first tasks at hand, in this as in all the affairs of life. A good woman friend of the Association has called attention to the need of more care in the issuance of marriage certificates. She suggests, and is acting on her own suggestion, that an organization be formed to place in the hands of every prospective groom and bride such specific information as physicians best qualified for the task might impart, in the form of small booklets. The county clerk or other officer could be supplied with copies to be given to all who apply for marriage licenses, and copies could be supplied direct to all young people. These publications could be brief, but should give references to the best available sources of information for further study.

Life insurance companies are beginning to discern the relation of their business to eugenics, and are open to suggestions as to how they can be of service. This applies especially to coöperative insurance companies whose sole interest is the welfare of their members. The members of an association of college women have entered upon a pledge that each member will require any acceptable man who should propose marriage to her, to take out life insurance, in part that there may be a pre-marriage medical examination. Every one of these suggestions, if tried, serves as a means of education, and often results in new information as to what is practicable. When men actually got into the air where they could sense in a practical way the forces they were actually operating, the further invention of the flying

machine went forward apace, and so with eugenics, since society has really entered into the subject, research and practical efforts will go hand in hand to develop the subject rapidly. And certainly one of the first places to work is at the desk of the county official who issues marriage licenses. A system which results in such a large percentage of divorces as the present, certainly needs all the study which modern scientific research can give it, and needs that enterprising means be used in an effort to secure better racial, moral, and economic results.

THESE ARE TIMES OF SCIENTIFIC IDEALS

In bringing the practical breeders together with the scientists there has been created in this Association an atmosphere of enthusiasm and an environment which is fertile with inspiration and which is favorable to maintaining high ideals. The time of aloofness, of the men in rural pursuits, from the larger constructive and coöperative activities of society is coming to an end. The increasing importance of our agriculture in a rapidly growing population and the consequent increasing food consumption, will increasingly bring about the entrance of the more active minds among men from the open country into fields of national activity. The American Breeders Association believes that by offering to the hundreds of thousands of breeders an opportunity to attach themselves to this national Association, which is both scientific and practical, it will do much toward giving their business a meaning, dignity, distinction as well as profit it never had before. It has come to be an honor to belong to this organization and a number of our members carry "MEMBER A. B. A." regularly on their stationery. The efforts of many isolated individuals who are ineffectively scattering their energies, here find those with whom they can coöperate, to lead or to help leaders.

The bringing together in the American Breeders Association of a large number of interested persons has given research in breeding a most wonderful impetus. Through the encouragement of the circuit breeding plan, and other plans on foot, the Association is leading a thorough systematization of the breeding interests. Thus great improvements of our plant and animal resources are being aided to more fully meet the demands of the market requirements in our own country. Breeding in America is being brought to such a point of superiority that this country will reverse its position from an importing country to a successful exporting country of superior breeding stock and fine seeds.

Breeders are coming to look upon their membership in this Association as a professional duty, as does the physician who joins a state or national medical society, or the engineer who takes a membership in the American Society of Mechanical Engineers, or the scientist who maintains membership in the American Association for the Advancement of Science. Its publications have been kept on both a scientific and practical plane, that this Association might become an organization for both scientific men and expert producers.

Here is a word from that veteran breeder of grapes, T. V. Munson, the man who has originated more varieties of grapes than any other man in America, showing the high value he places on his membership in the American Breeders Association: "I regard the American Breeders Association as the most important and influential agricultural association in America, and probably second only to the American Association for the Advancement of Science in promoting general progress and welfare of the nation."

PREACHERS AND EUGENICS

In a recent conference devoted to the betterment of the country church where the discussions had centered about education and religion as the two great agencies of racial advancement, eugenics was suggested as a third agency. The discussion revealed the fact that the preachers of the country are not well abreast of these eugenic times, and there was even a show of aloofness on the part of some preachers. On the other hand, most of these men displayed open minds and were ready to know and eager to seek the newly developed facts and philosophy of this third method of leading to a happy racial status. It was stated that if we could clear the "network of human descent" of its worst dross in the form of feeble-mindedness, tendency to immorality, weakness for stealing, and other frailties of genetic origin, that education and religion could make progress in a normal way with the life of each and every individual.

Our preachers need to read of both the results and the technical methods of plant breeding. They should gain a grasp of the philosophy of the animal breeder. And they should delve into the depths of science which Mendel and his followers have built up. They would come more clearly to see that "Nature is God's Unabridged Book," and that it affords standards with which to measure man's works. They would not only be merely earnest and open-minded in their efforts to harmonize the written word and the pages of history in

nature, but they would be more ready to join in nature's evolutionary processes in the betterment of all living things. The well-nigh immortal unit characters give a new racial meaning to the concept of the soul. There is a phase of immortality attached to each Mendelian unit character. Mendel, the abbot, builded better than he knew.

The development of a science of eugenics is placing before preachers as well as before our teachers, physicians, publicists, and other intellectual leaders a new responsibility: The placing of this new phase of our racial life and well-being properly in the minds of the mass of people. Its facts, its warnings, its constructive philosophy, its oncoming practical features, must be made a vital part of the training of every liberally educated person. Our universities and colleges are already beginning to frame up courses in genetics, using facts concerning plant and animal breeding as the groundwork, but strongly developing that division of the subject which relates to the breeding of the human race. Genetic clubs and societies, often called eugenics societies, are being organized at our universities, notably at Cornell and the University of Wisconsin.

No subject brought up for general discussion and solution during recent times is fraught with more possibilities for good or bad than eugenics. Its wrong development might turn the tide against its consideration, or might direct it into lines which would tend to break down morality. Even its becoming a fad as a merely interesting subject is to be feared. It is not the subject for the narrowly housed scientist, nor for the person who wants something interesting as an avocation. It is not to be studied by society people because it affords entertainment, nor is it to be allowed to be "featured" by sensation mongering newspaper reporters. It is rather a subject for the conservators of society, for the practical scientist, the philanthropist, preacher, teacher, editor, father, mother, or other leader.

The facts and principles of eugenics are to become a substantial part of the thought and every-day philosophy not only of educated people but of the masses. And the assistance of all churchmen will be greatly needed to aid in developing the philosophy along wholesome lines, and in carrying to all the people those facts and rules of practice which will best serve the race. When it is realized that it must become almost a racial religion for those with superior heredity to multiply more rapidly, and for those with inferior heredity to multiply less rapidly, in order that the race may evolve upward, a new burden will be placed on the preacher. That the church lay hold of this new agency of eugenic righteousness and place it effectually beside education and religious teaching as the third great agency

for the regeneration of the race, the preachers must study to know the facts, and must be schooled in interpreting the facts of science into the language of the masses. Which universities will be first in offering at least summer courses in eugenics for preachers, Y. M. C. A., Y. W. C. A. workers, and other leaders in religion?

In another place in the *Magazine* is given a list (selected by the Superintendent of the Eugenics Record Office, Mr. H. H. Laughlin) of some of the literature pastors would find helpful in gaining a conception of genetics. That portion of this subject especially relating to eugenics, or the genetic improvement of man, needs wide consideration by many minds that only those things which are wise, practical, and ethical shall be put forward. The preachers are needed in this preliminary development of the subject, that they may assist in giving it an ethical, altruistic, and religious turn.

CHARLES WILLIS WARD, FRIEND OF A. B. A.

The donation by Mr. Ward, of a subscription to *Out Door World and Recreation* to each of the entire membership of the American Breeders Association, was not only a gracious compliment to the members, but it was also a signal service to the Association.

From the very first, in 1904, when Mr. Ward became a life member of the Association, he has shown a deep personal interest in the work of this organization, and a solicitous care in its welfare and has repeatedly extended his help. First by acting as vice-president of the Association in its young days, when counsel and energetic work were most needed; we recall also the generosity with which Mr. Ward defrayed the bill for rent of the hall in which the meetings of the Association were held in 1908 in Washington, D. C.

At that time the Association had not the firm footing it now has. Matters certainly have changed and scientific and other institutions make it a point of honor to place at our disposal their available meeting halls and lecture rooms. These are facts over which the Association has every reason to be exceedingly gratified.

The American Breeders Association has in Mr. Ward a staunch friend and wise counsellor. He is possessed of that spontaneous and earnest enthusiasm which always marks the man of success in business; he has the understanding and vision concerning the work and future of the Association and its place as one of the most important welfare organizations in this country. The vote of appreciation passed by the Association in general session is a well earned tribute to its good friend.

NEWS AND NOTES

EUGENICS AT THE NATIONAL CONFERENCE OF CHARITIES AND CORRECTION

As part of the Thirty-ninth National Conference of Charities and Correction which was held at Cleveland, Ohio, from June 12 to 19, the section on Sex Hygiene held a number of meetings of which one was devoted, exclusively, to the discussion of eugenics.

The presiding officer at this meeting was Mr. Bleecker Van Wagenen of New York who, after speaking briefly on the "Eugenics Program" introduced, in turn, the following speakers: Prof. R. M. Yerkes, Harvard University, who spoke on "Eugenics: Its Scientific Basis and Its Program;" Dr. Henry H. Goddard, Vineland Training School, the topic of whose address was "Marriages of the Unfit;" and Dean Walter T. Sumner, Chicago, who spoke briefly concerning sex problems and eugenics. The paper of Dr. C. B. Davenport of Cold Spring Harbor on "Eugenics and Charity ' was read in his absence. The formal program was followed by a public discussion in which many members of the audience asked questions or spoke concerning phases of the eugenic problem and program which especially interested them.

Chairman Van Wagenen, in his introductory remarks, very clearly and effectively stated the eugenics problem. He produced statistics which served as convincing evidence of the unsatisfactoriness of our racial status, and he thus effectively prepared the way for the speakers who were to follow.

In his address, Professor Yerkes, after sketching the history of the eugenic idea and defining the present eugenic movement, attempted a systematic discussion of the necessary scientific basis of eugenic efforts, and proposed a eugenic program.

He briefly defined eugenics as *systematic endeavor to improve the nature of man*, and proposed, as the chief lines of activity toward this end, *education*, *investigation*, and *legislation*. Education, he emphasized as the necessary condition of profitable investigation and of safe legislation. Of the several directions of educative endeavor, he mentioned especially education (a) concerning the facts and laws of heredity and of their relations to environmental influences; (b) concerning the responsibility of the individual to himself, to his fellows, and to generations yet unborn; (c) concerning the intelligent appreciation of proper, socially and racially profitable marriages;

(d) concerning the intelligent production and up-bringing of children; (e) concerning opportunities to render social service by enlightening one's fellows.

Under legislation, Professor Yerkes proposed that a federal bureau of public welfare be established among the important functions of which should be the encouragement of the scientific study of heredity, the collection of statistics concerning family traits, and the accumulation of such data as should condition wise legislation and eugenic advice.

Dr. Davenport very briefly discussed the dangers of certain kinds of charitable work and contrasted with them the possible benefits of eugenic endeavor. He forcibly pointed out the uncertainty of results in charity, and insisted that our racial problems may be much more rapidly and economically, as well as effectively, solved by striking at the roots of the evils which charity attempts to ameliorate.

In discussing "Marriages of the Unfit," Dr. Goddard described the results of studies concerning the transmission of feeble-mindedness and presented, in some detail, the picture of a family in which two strains appear: the one continuing a family history remarkable for intellectual ability and social serviceableness; the other presenting an appalling array of mental and moral defects.

This family history has been published by the Macmillan Company under the title, "The Kallikak Family."

Dean Summer's remarks concerned the social evil, sex diseases and the urgent need for eugenic enlightenment and action.

The meeting definitely indicated the keen interest of social workers in the possible values of eugenics for the solving of their problems—the problems, namely, of poverty, pauperism, disease, crime, and immorality.

A MINISTER'S LIST OF BOOKS ON EUGENICS AND HEREDITY

This is the list of books referred to in the editorial, page 64. The titles are arranged in the approximate order in which the books are of value to the minister who desires information on the subject of eugenics.

HEREDITY IN RELATION TO EUGENICS. C. B. Davenport. Henry Holt and Company, New York, publishers.

THE KALLIKAK FAMILY. H. H. Goddard. The Macmillan Company, New York, publishers. $1.62.

THE METHOD OF RACE-REGENERATION. Dr. C. W. Saleeby. Moffat, Yard and Company, New York, publishers.

THE PROBLEM OF RACE-REGENERATION. Havelock Ellis. Moffat, Yard and Company, New York, publishers.

THE DECLINING BIRTH RATE. Arthur Newsholme. Moffat, Yard and Company, New York, publishers.

THE SOCIAL DIRECTION OF HUMAN EVOLUTION. W. E. Kellicott. D. Appleton and Company, New York, publishers.

THE HUMAN HARVEST. David Starr Jordan, American Unitarian Association, Boston, Mass., publishers.

RACE CULTURE OR RACE SUICIDE. Robert R. Rentoul. The Walter Scott Publishing Company, London, England.

HEREDITY. W. E. Castle. D. Appleton and Company, New York, publishers.

BREEDING AND THE MENDELIAN DISCOVERY. A. D. Darbishire. Cassell and Company, New York, publishers.

HEREDITY AND SOCIETY. William C. D. Whetham. Longmans, Green and Company, London, England, publishers.

BIOLOGICAL ASPECTS OF HUMAN PROBLEMS. Christian A. Herter. The Macmillan Company, New York, publishers.

HEREDITY AND SOCIAL PROGRESS. Simon N. Patten. The Macmillan Company, New York, publishers.

THE COMING GENERATION. William B. Forbush. D. Appleton and Company, New York, publishers.

ORGANIZATION OF A EUGENICS SOCIETY IN UTAH

Through the instrumentality and under the leadership chiefly of members of the American Breeders Association, a State Eugenics Society was organized at Salt Lake City, Utah, during the latter part of May of this year. We wish the Utah contingent abundant success in their venture which, as stated by their spokesmen and women, "is more for the purpose of studying eugenics than with an active propaganda in view." The news of this move has been received differently in different quarters. Thus for instance, the editor of the *Utah Republican* remarked at the time of organization. "That the wisdom of the course of organizing for the purpose of study, rather than active propaganda, is manifest. Great reforms are always possible up to the point where they challenge human nature" and concludes: "where the applied science of eugenics seeks to work through man-made laws it will meet its Waterloo." He evidently thinks that the study of this subject is an entirely harmless diversion, and that the use of the knowledge obtained by research to enlighten mankind is impossible.

We trust the Utah Eugenics Society will be held closely to its purpose by the scientific men responsible for its organization and that

it will become an active and working body and will make use of the abundant research material available in the race conglomerate of Indians, half breeds, orientals and especially the old Mormon families of whom no doubt church and other records exist reaching far back.

ELIMINATION IN THE THIRD GENERATION FROM A CROSS

When one has made a wide cross between strains of ornamental plants (for instance, cannas), it is not difficult to pick out the required types from the first or second generation, by simple inspection. For these strains of plants being grown only for show, good looks are the most important requirement. But when one is working with field crops, fruitfulness and vigorous growth come first; and appearances are only considered secondarily, or not at all. In scientific breeding, after the second generation has been grown, and all possible eliminations have been made from it by inspection, the remaining strains may be tested for vigor and productivity by sowing about a hundred seeds of each, and crowding them among another crop, so that only a small percentage will survive. Those families whose survivors yield the greatest crop, in spite of the crowding, will show, by the survival of the strongest, that they are in this respect well adapted as forage plants for field culture. (For, even with corn, the greatest crop on a given acreage can only be had by crowding the stalks more closely than would be indicated by the conditions for the best individual yield. And the same is the case with most other field or forage crops.) Such an automatic selection of the many undetermined characters which combine to produce a good yield, will often be a quicker and cheaper method than trusting to the eye alone as a means of selection and elimination.

The Velvet and Lyon beans are grown in Florida as forage crops. The fields have to be kept clear of weeds at first; but when the vines have spread between the rows so that cultivation ceases, their growth is usually sufficient to stifle the weeds. Hence the first recommendation for a new bean of this type is a superior ability to choke down weeds. From the second generation of the cross between the Velvet and Lyon beans, grown in hills 8 feet apart, 82 individuals were selected, and their seeds sown in an elimination field, for the third generation. Along with them were sown, for comparison, pure lines of the Velvet and Lyon beans. The elimination field was set out with lines of sorghum 8 feet apart, the sorghum being sown thickly as if for silage. When the sorghum had sprouted, 100 seeds (in most cases)

of each of these second-generation plants were dibbled by hand in the rows of sorghum, 2 inches deep and 4 feet apart. When the young plants came up, they had to struggle with the sorghum; and, out of 6093 seeds, only 740 produced plants that bore pods. The amount of the crop produced by each family under these circumstances was a valuable guide to the properties of that strain; for, although most (or all) of the parents were heterozygous in some points, yet, as is usual in self-fertilized plants, the majority of their offspring resembled the parent in somatic characters. The further growth of strains which headed the list, or were low down in it, justified the placing of some confidence in the results of the elimination. The more factors in which the original parents differ, the more useful will probably be the elimination test.— JOHN BELLING, *Gainesville, Florida.*

A FARM FOR BREEDING MEDICINAL PLANTS

What might be called a private experiment station for plant breeding is being developed in connection with the scientific departments of the Eli Lilly Company, pharmaceutical chemists, Indianapolis, Indiana. The investigations being carried on at these laboratories suggest an entirely new field in plant breeding. Valuable medicinal plants are being introduced from other countries and their improvement attempted through the application of the best methods of plant breeding. Selections based upon chemical assay and physiological tests are being carried out on many individual plants of *belladonna*, *henbane*, *stramonium*, *digitalis* and others. Variety tests are also performed in the open field, and such conditions as the influence of relative yield, curing properties, harvesting of roots, leaves, etc., are subjects of investigation. The work is conducted by the Botanical Department of the Eli Lilly Company (member A.B.A.), which has greenhouses, an experiment farm, and all necessary laboratory equipment for carrying on such work. Mr. Frank Miller is in charge of the plant breeding work.

THE ARNAUD SHEEP-GOAT HYBRID

The accompanying illustrations represent a peculiar case of a hybrid resulting from a sheep-goat cross. Figure 1 shows the hybrid and Figure 2 its twin, which is not a hybrid. Figure 3 shows the dam, figure 4 the sire of the sheep-goat hybrid, and figure 5 the sire of the lamb that was born a twin to the hybrid.

This hybrid was produced on the farm of Mr. E. Arnaud a few miles south of Monet, Mo. The writer has seen the animal since its

FIG. 1—HYBRID OF SHEEP-GOAT CROSS.

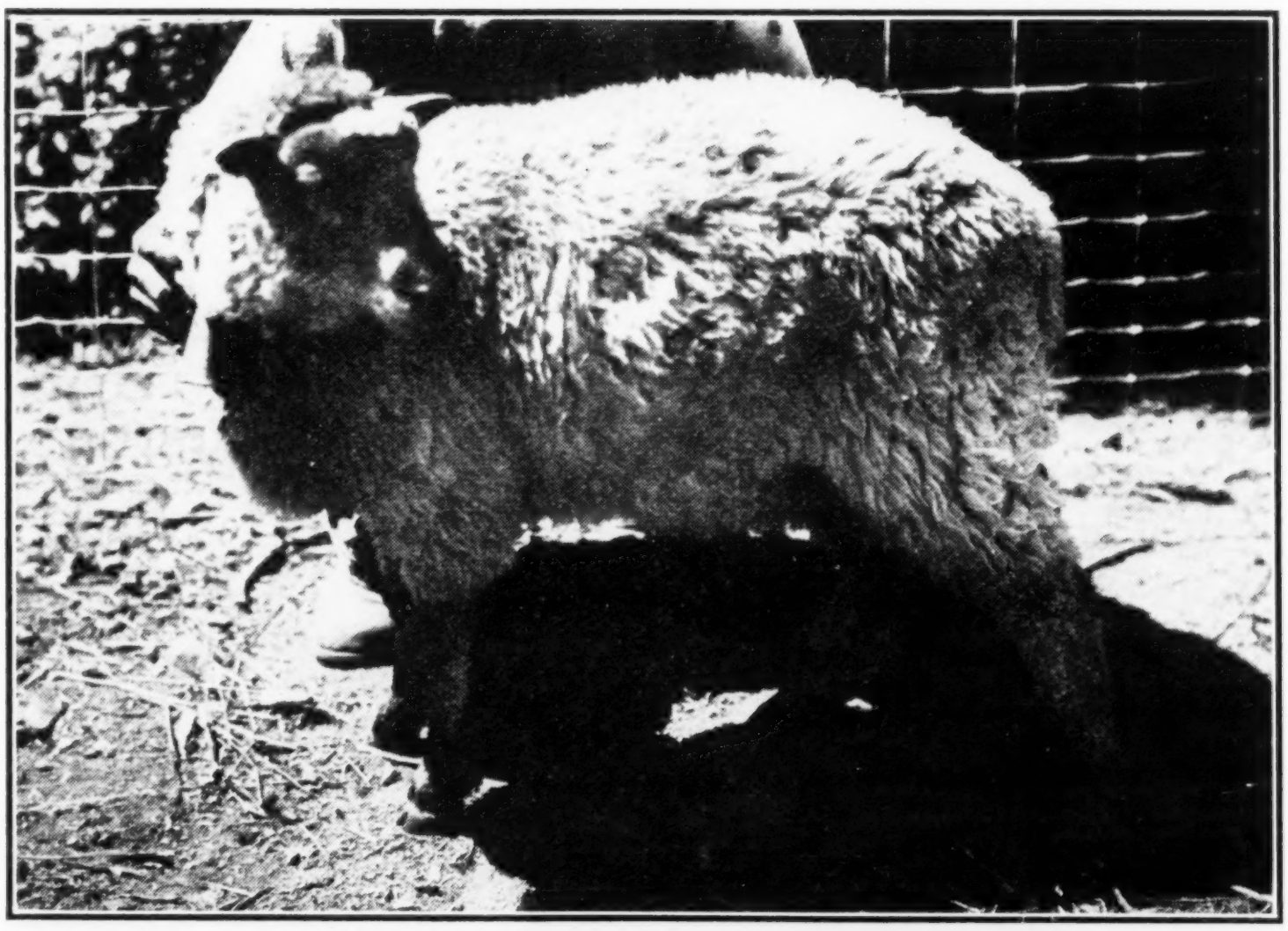


FIG. 2—THE TWIN OF THE SHEEP-GOAT HYBRID SHOWN IN FIGURE 1.

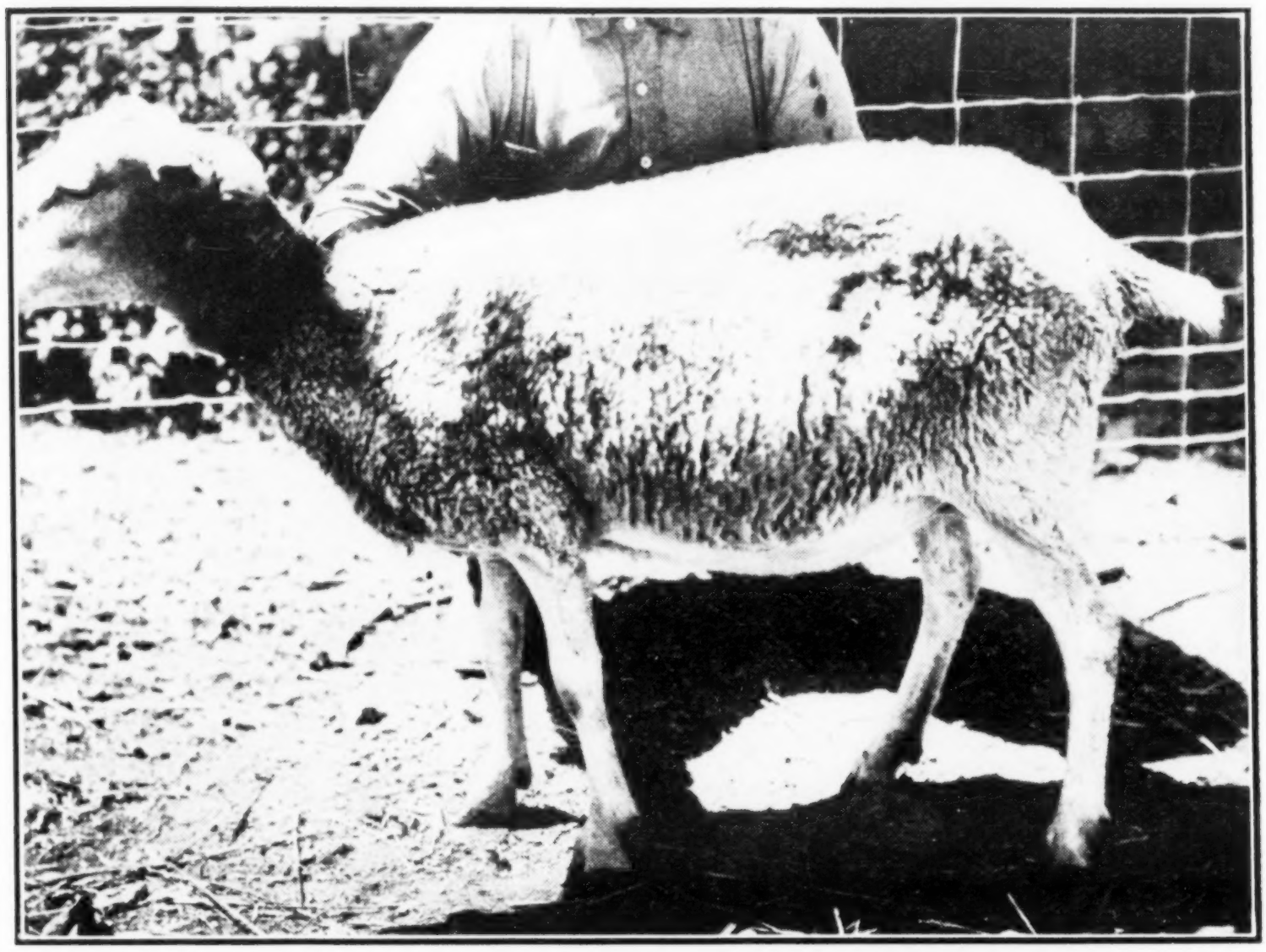


FIG. 3—DAM OF SHEEP-GOAT HYBRID AND ITS TWIN.

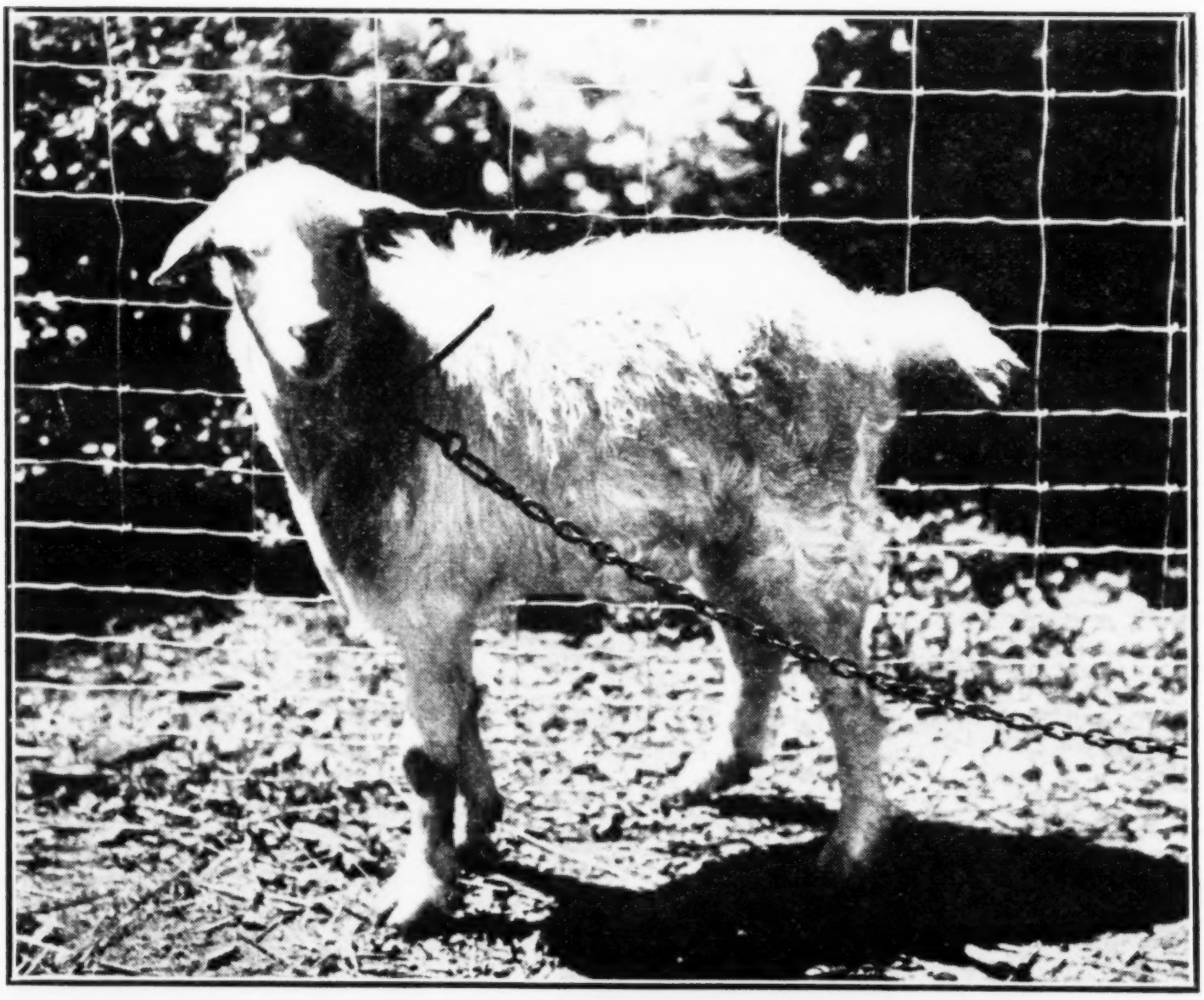


FIG. 4—SIRE OF SHEEP-GOAT HYBRID.

maturity, and finds that its body is generally covered with goat hair but it has also a small shaggy growth of sheep's wool, especially on the back. This hybrid is a female and appears to be infertile, but not absolutely so for it has once produced a half grown foetus.

The only other sheep-goat hybrids of which the writer has been informed are four produced on the ranch of Mr. C. J. Jones ("Buffalo" Jones), of New Mexico, who states that all four of these hybrids are females. This is of interest in connection with the fact that nearly

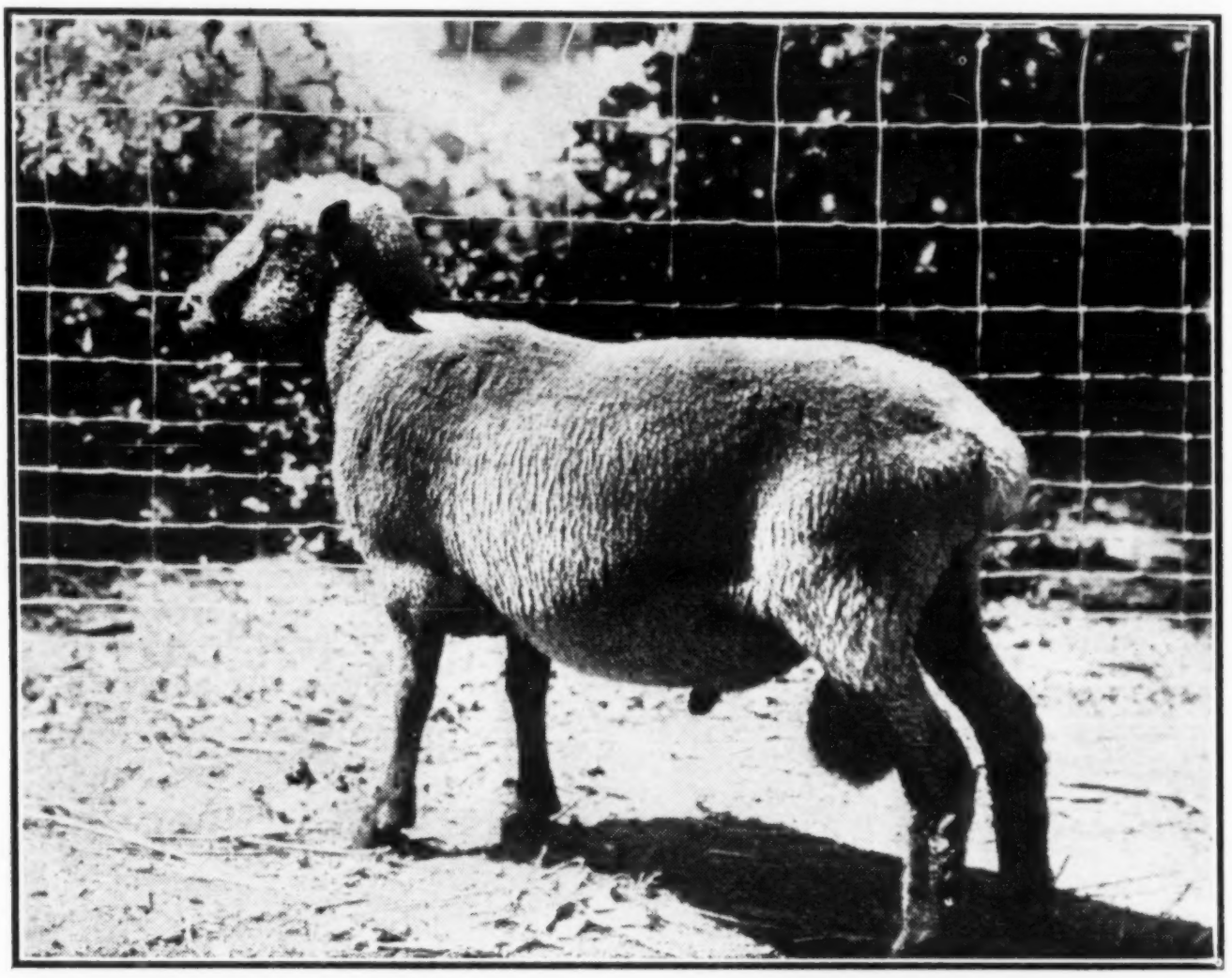


FIG. 5—SIRE OF THE LAMB, TWIN TO THE HYBRID.

all the hybrids between buffaloes and cattle that have been produced in this country have been females.—W. J. SPILLMAN, *Washington, D. C.*

MENDEL JOURNAL DISCONTINUES

The *Mendel Journal* announces in its September, 1912, issue "That no further numbers of the *Mendel Journal* will be published." The suspension of this publication is greatly to be regretted, whatever may have been the reasons for this step. The *Journal* covered the entire field of general genetics literature, and was always interesting and readable.

BLACK FOX BREEDING

At the Annual Meeting of the Association a year ago, I gave a brief account of the beginning of the black fox business on P. E. Island. Some of the members of the Association were somewhat startled at the unusual prices obtained for live foxes for breeding purposes and thought prices must certainly come down. But the tendency has since been an upward one. In fact, prices are almost double what they were a year ago.

European capitalists are getting interested in this business and six pairs of foxes have been sold to a concern in Russia for $100,000 to be delivered next year. It is apparent that the fox business is yet in its infancy in this country and that the demand for valuable furs will steadily increase. The price of breeding animals is so large now that only an individual here and there can reach it, and as a consequence companies are being formed for the purpose of breeding foxes on a commercial scale. But there is a warning to be sounded. Many are losing sight of the fact that it is only the very best individuals that bring the high prices for their fur and in their haste to get foxes to breed many purchasers are getting a class of stock that will not produce high priced fur. I think that after while, much more attention will be given to this and the quality of the fur will be the first consideration.—B. I. RAYNER, *Alberton, P. E. Island, Canada.*

A CORRECTION

Members are requested to make the following corrections in their copies of the Annual Report, No. VIII.

Page 573, Cut Fig. 3 should appear over legend to Fig. 7.

Page 576, Cut Fig. 7 should be over legend to Fig. 8.

Page 576, Cut Fig. 8 should be over legend to Fig. 3.

PUBLICATIONS RECEIVED

THE PRIMARY COLOR-FACTORS OF LYCHNIS AND COLOR-INHIBITORS OF PAPAVER RHOEAS. George Harrison Shull, Reprint from the *Botanical Gazette* vol. liv. August, 1912.

From Dr. George Harrison Shull, Cold Spring Harbor, Long Island, N. Y., also the following publications:

EXPERIMENTS WITH MAIZE. Reprinted from the *Botanical Gazette*, 52, December, 1912. Pp. 480–485.

A PILGRIMAGE TO BRUNN. Reprinted from the *Antiochian*, vol. 2, June, 1912.

HERMAPHRODITE FEMALES IN LYCHNIS DIOICA. Reprinted from *Science*, no 928, October, 1912. Pp. 842–843.

"GENES" OR "GENS?" Reprinted from *Science*, N. Y., no. 908, May 24, 1912. Pp. 819.

"GENOTYPES," "BIOTYPES," "PURE LINES," AND "CLONES." Reprinted from *Science*, N. Y., no. 888, January 5, 1912. Pp. 27–29.

INHERITANCE OF THE HEPTANDRA-FORM OF DIGITALIS PURPOSEA L. Reprinted from *Zeitschrift fur Inductive Abstammungs and Vererbungslehre.* 1912. **Bd. vi. Heft 5.**

JOURNAL OF GENETICS, vol. 2, no. 3, November 1912. Contents:

L. DONCASTER, "The Chromosomes in the Oogensis and Spermatogenesis of *Pieris brassicae*, and in the Oogenesis of *Abraxas grassulariata*;" CLIFFORD DOBILL, Some Recent Work in Mutation in Microorganism;" R. C. PUNNETT, "Inheritance of Coat Color in Rabbits;" A. H. TROW, "On the Inheritance of Certain Characters in the Common Groundsel;" FREDERICK KEEBLE AND E. FRANKLAND ARMSTRONG, "The Role of Oxydases in the Formation of the Anthocyan Pigments of Plants."

FURTHER CONTRIBUTION TO THE STUDY OF THE INHERITANCE OF HOARINESS IN STOCKS (MATTHIOLA). Edith E. Saunders. Reprinted from the *Proceedings of the Royal Society*, B, vol. 85, 1912.

ON THE RELATION OF LIMANIA ALPINE TYPE TO ITS VARIETIES CONCOLOR AND ROSEA. Edith R. Saunders. Reprinted from the *New Phytologist.* June 1912. Pp. 167–169.

NEW BOOKS

PROFITABLE BREEDS OF POULTRY. Arthur S. Wheeler. The Outing Publishing Company, publishers, New York, 1912. Pp. 134. Price, 70 cents net.

A useful and helpful book for the beginner or novice who is making an unprejudice study of breeds preparatory to going into the business, either as source of profit or as a hobby. This booklet does not undertake to describe all existing breeds of poultry, but confines itself to a few breeds which in the opinion of the author are the profitable breeds. Separate chapters are devoted to the Orpingtons, Rhode Island Reds, Mediterraneans and Cornish. These chapters contain besides descriptions and historical references, observations on the breeding and mating of the fowls for best results. Now and then is thrown in, a bit of breeding philosophy. Thus the author opines that: "The man who squats for an hour in a henhouse on a cold winter day, to study the points of his breeding birds, may arouse the beholder's sense of humor, but he is the fellow who will get from his matings, offspring, 10 per cent better than the parents and consequently more profitable. . . . Crossing, except by way of experiment, is poor policy." "A single variety is enough for the average plant."

There is a brief chapter on the keeping, management and housing of poultry and some very good general advice. Certain remarks

on the business and financial side of the poultry business are worth taking to heart. The author has this to say: "I doubt if a man of small capital ought to take up poultry with an idea of making money, unless he has a genuine love for birds." And closes the book with this warning: "One merely grins when a man of means rises to a gaudy bait, but I have known poor men and women who risked, and lost, money they could ill afford, under the delusion that eggs from the pen of Gimcrack II, the sure sire of winners, would put them in the way of astounding the local bank. Viewed sanely, it is either a pleasure-giving avocation, or a handy method of deriving generous interest from an investment of money, skill and persistent and sympathetic labor."

FALSE MODESTY. Dr. E. B. Lowry. Forbes and Company, publishers, Chicago, 1912. Pp. 110.

The author is doing the world of men and women a real service by the publication of her series of books on personal purity and on matters pertaining to sex. In this booklet, which can be read in an hours' time, it is shown that society at large is countenancing certain ideas of modesty, which are not only totally false, but which are responsible for untold harm, causing misery, destruction of health, honor and life. The booklet is an appeal not only to fathers and mothers but to all who may have children in their charge, to break the conventional conspiracy of ignoring silence.

This modest and sensible little booklet has condensed in its eight chapters, the wisdom which has been gathered in a wide and varied medical experience of years and every word of it is worth reading. The false modesty and smugness with which society is stupidly covering up it vices, sins and shortcomings is scored and the need of instructing our boys and girls concerning sex hygiene is supported by unanswerable argument. Dr. Lowry outlines an aggressive program in educational reform and suggests that the womens clubs, ladies aid and home missionary societies, which when we come to analyze it are the initiators of practically all reforms, take up the subject of sex hygiene and of educating parents to the immense importance of taking a correct and sensible view of those matters, so that in turn these parents may instruct their sons and daughters. According to the author there is greater need of this form of instruction in the country districts than in cities.

False Modesty is a good book to place in public libraries. On account of its low price it should be possible for social reform societies

and clubs to purchase and distribute it in large numbers among persons who may be benefited by its advice and help.

REFERENCES IN CURRENT LITERATURE

A NEW SUBSPECIES OF ZEA MAIS L. Dr. Walter B. Gernert, University of Illinois. Reprinted from the *American Naturalist*, October, 1912.

The author describes a new type of corn which originated on the Experiment Station Farm at Urbana, Illinois, in 1909 apparently by mutation, from a strain which has for a number of years been selected for high protein content. The new type is characterized by a broadly conical ear, which has, in place of a cob, an inner central stem which bears numerous irregular branches which bear the kernels. The name *Zea ramosa* has been proposed as a specific name, justified by the species named by Sturtevant, as indentata, tunicata, evepta, indurata, etc.

The heredity of this new corn is fairly established, breeding true to type. The ears are true female organs and not merely modified male florets such as are occasionally found as sports. Observations are being made as to the possible economic value of this strain of corn; at present its yield is less than of common corns but could perhaps be increased by selection or hybridizing. It is thought, that being practically without cob it might be a good feeding or ensilage corn. Further breeding and tests are being made to determine its agricultural value.

THE CHURCH'S STAND FOR PURITY. *Literary Digest*, June 29, 1910.

Review of journalistic and press comment on the recent action of the Very Rev. W. T. Sumner, Dean of the Episcopal Cathedral in Chicago, requiring presentation of a satisfactory medical certificate from persons presenting themselves for marriage. The *Litery Digest* reviews the situation with its usual aptitude and sums the matter up in the following:

> General, though not unanimous, approval greeted the refusal of the Protestant Episcopal Cathedral clergy in Chicago to marry any person without a physician's certificate of freedom from incurable or communicable disease . . . . All the physicians quoted in *The Medical Times* commend Dean Sumner's plan. Some of them urge legislation making the possession of such certificate a prerequisite to marriage. Among the ministers, there is a universal desire to prevent the marriage of the unfit, but some disagreement as to the methods. The Chicago plan is heartily indorsed by the Rt. Rev. Samuel Fallows, presiding bishop of the Reformed Episcopal Church, Rev. John Haynes Holmes

of New York, Rev. Charles H. Parkhurst, President Emeritus Tucker of Dartmouth, Rev. G. C. Peck of New York, Rev. Russell H. Conwell of Philadelphia, and President McMaster of Mt. Union College. Others, like Bishop Anderson and McConnell of the Methodist Episcopal Church, Bishop Williams of the Protestant Episcopal diocese of Michigan, and Bishop Niles of New Hampshire, while expressing sympathy with the general movement, give the action of the Chicago Cathedral clergy a more qualified approval. Rabbi Joseph Silverman of New York favors the advisability of a compulsory health certificate, and the Rev. Henry M. Sanders of New York, who doubts "whether the Church can wisely do more than exert its influence in that direction by means of education," thinks that, as marriage is a civil contract, "the State can better exercise this supervision, under the direction of the medical profession, than the Church."

The magazine editor has closely followed the comment on this matter made by publicists, divines, physicians and editorial writers in all sections of the country, and concludes that the proposition has been favorably received and practically without a voice in opposition. Several question whether such rules can be enforced even if generally adopted and that the regulations, or even law, "would be craftily and incessantly violated, in view of the common disrespect for law and order," and thus work hardship upon those who placed too full trust in the regulations. Several divines express the fear that such regulations, strictly enforced, might drive marriage from the church to the civil authorities. But neither of these contingencies are likely to arise. The medical profession may safely be depended upon to check quickly disreputable practices which might arise in the issuance of certificates of physical soundness. On the other hand, those whom the church for cause refuses to marry, would by going to the civil officer, soon cause this class of marriage institution to exercise discretion, as the state could not afford to allow its institutions to fall into disrepute.

The unexpected action of Dr. Sumner has broken the ice so far as coöperation of the church with other social agencies is concerned. He has placed the matter before a constituency which heretofore has had no particular viewpoint on eugenics, and he has very definitely pointed out the direction in which the church can make its contribution to voluntary negative eugenics, all without agitation and without legislation. The American Breeders Association invites all clergymen to become members of this organization, both that they may keep abreast of the latest thought, and that they may coöperate in pushing forward the good work the Association has started.

ASSOCIATION MATTERS

ELECTION OF LIFE MEMBERS DURING THE FOURTH QUARTER 1912.

Mr. J. Lawrence Hamilton, Brighton, England; Mr. V. Culberson, Fierro, New Mexico; Dr. F. R. Harris, Henderson, North Carolina; Mr. Pandurang Khan Khoje, Pullman, Washington; Mr. Wm. C Sharbrough, Holly Bluff, Mississippi; Mr. W. Atlee Burpee, Philadelphia, Pennsylvania; Dr. Vaseelie Yurieff, Kharkow, Russia; Miss Sybil Hyatt, Kinston, North Carolina.

A NEW A. B. A. CIRCULAR

The office of the secretary of the Association has lately gotten out a 17-page circular, designed for use in interesting persons in the work of the Eugenics Section and getting new members for the Association. The title, "Eugenics and the General Genetics Movement" explains its contents, which consist of a condensed statement concerning the organization, work and purposes of the American Breeders Association with special reference to its Eugenics Section, and the bearing of Eugenics on society and on various lines of human thought and activity. This circular, which is designated Circular No. 1, will be mailed to all persons who make request for it, and also to all persons whose names are sent in by members and who might be induced to take membership.

A SPECIAL PRIVILEGE TO MEMBERS

Mr. Charles W. Ward, a Life Member of the American Breeders Association and widely known as a breeder of carnations and peonies, a nature lover and owner and editor of the *Out Door World and Recreation Magazine,* has made a splendid present to the American Breeders Association and authorizes the secretary to announce that every new and paid-up American member of the Association will receive a complimentary subscription to *Out Door World and Recreation* during the year 1913. This places no member of the Association under any obligations whatsoever, as all will receive *Out Door World and Recreation* as a part of their membership privilege, same as they receive the *American Breeders Magazine* and the *Annual Report A. B. A.*

Members, who are in arrears for 1911 and 1912 and who wish to benefit from this offer, must pay up their dues to date.

Out Door World and Recreation is a high class, elegantly illustrated magazine; the lover of nature, and lover of wild plant and animal life cannot fail to appreciate it. It is not merely a magazine for entertainment, but it stands for a cause and seeks to accomplish something. Mr. Ward has recently perfected a deal whereby a large island off the coast of Louisiana has been permanently set aside as a refuge station for migratory birds.

Foreign members of the Association may avail themselves of this offer by remitting to this office the amount of the postage which is 65 cents per year to Canada and 75 cents to all other foreign countries.

THE AMERICAN BREEDERS ASSOCIATION AND THE NATIONAL CORN EXPOSITION

The National Corn Exposition typifies splendidly the new spirit of education in agriculture. It is an agricultural winter fair, the only one in the United States, and governed by men who have the upbuilding of American agriculture at heart.

The American Breeders Association, itself a public welfare organization, recognizing the value and influence of the National Corn Exposition has at different times so arranged that its annual meetings were held in connection with the Exposition, benefiting by such an arrangement.

This year again, the A. B. A. held its meeting as the guest of the National Corn Exposition and it is again met by the same cordiality, the same generousness, and helpfulness as in other years. The Exposition authorities have, as heretofore, done everything so far as was in their power, to make the meeting of the A. B. A. a success. The American Breeders Association has in the National Corn Exposition a most staunch friend; it has always been a pleasure to coöperate with its officials and we trust that the individual members of our association will use every opportunity to promote these cordial relations and to help build up the Exposition into the great national agricultural fair needed to inspire the American farmers to greater excellence in production of farm commodities, in education, in rural, social and civic life, and in a genetically better race of people.

ADVERTISING IN THE MAGAZINE

Beginning with January, 1913, the *American Breeders Magazine* will open its pages to general advertising. This step has been taken by the Council after thorough consideration of the case. The grow-

ing membership of the Association and the outstanding high character of its annual membership, life membership and other readers of its publications make the pages of the *Magazine* a valuable business asset to the Association, too valuable not to be used. Before now, repeated requests for the purchase of space had been turned down as the postal laws made it impracticable for the Association to solicit advertising. The passage by Congress of the Act of August 24, 1912, cleared and simplified the situation and the Association is now in position to utilize this asset.

A contract has been entered into with an advertising firm, which has a plan of handling the advertising of a group of scientific journals, whose combined circulation gives advertising business houses a guarantee that their advertisements will be read by a wide and a most desirable constituency, or in other words high class readers—people with a wide range of wants, and the means to purchase what they need and want.

Members are requested to assist in building up this department of the *Magazine*; they have the assurance of the editors of the Association that the reading matter will not be curtailed, and that advertising will appear in additional pages. Any earnings which may arise from this department will be devoted to the improvement of the *Magazine*.

WHO HAS THEM

The Library of the R. I. Agricultural Experiment Station, Kingston, R. I., desires to obtain volumes I and II of the Annual Reports A. B. A., and has for disposal volume III of the same.

Members of the Association who have these publications to sell or exchange will kindly communicate with the librarian of the Experiment Station.